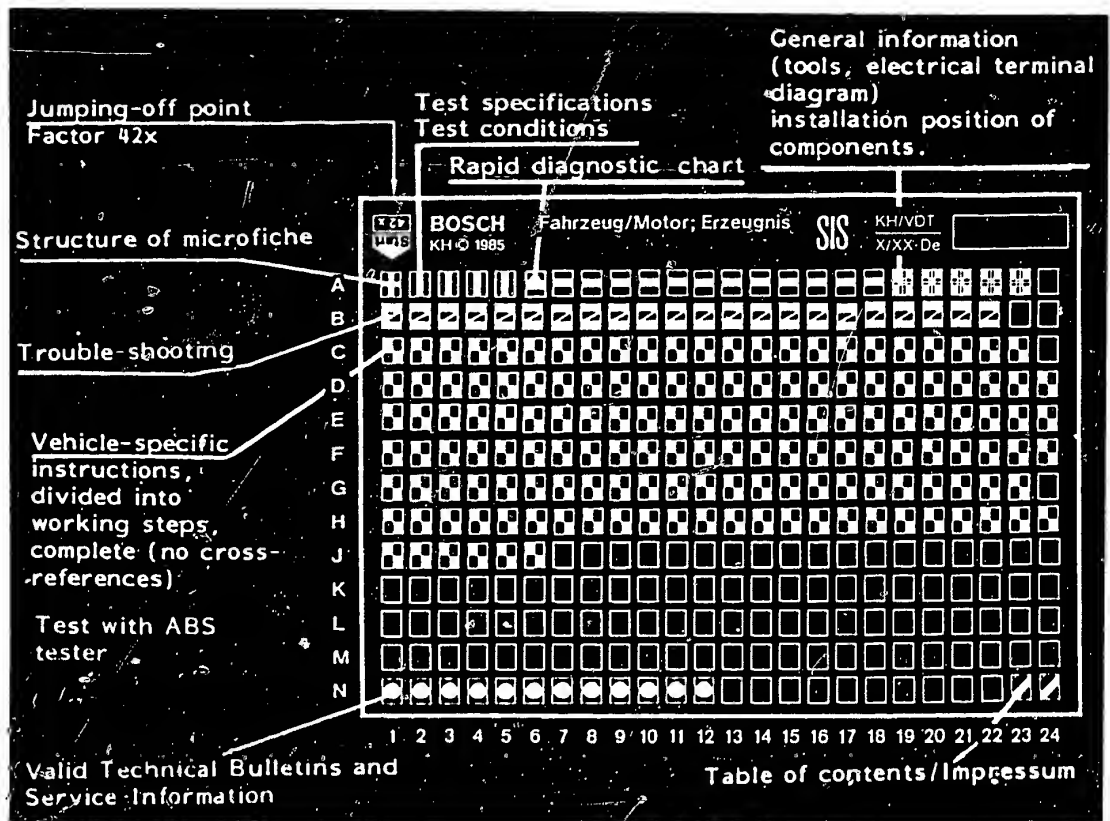


Structure of microfiche

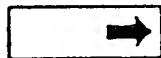


1. Read from left to right
2. Title of microfiche (appears on each coordinate)

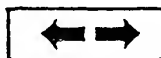
E16	Product/component/test step
	Vehicle/engine

Coordinate

3. Limits of section



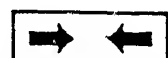
Beginning



Mid-section



End



One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

C6

A1	Trouble-shooting program	
-----------	--------------------------	--

SPECIAL FEATURES

- ABS system with 3 wheel-speed sensors and 3 hydraulic channels.

If the vehicle has ETC (Electronic Traction Control), the front-axle ABS wheel-speed sensors are also used for the electronic traction control. The rear axle has separate wheel-speed sensors for ABS and ETC.

The rear-axle wheel-speed sensor signal is also fed to a control unit for signal conversion and is evaluated for the speedometer reading.



1. TEST SPECIFICATIONS

For reasons of safety, the ABS may be tested only with the ABS tester.

The rapid diagnosis chart contains all important test specifications as well as instructions for testing and for trouble-shooting.

2. TEST CONDITIONS FOR TESTING WITH ABS TESTER

- The tester must have been converted to the latest technical status (identification "U2" on nameplate or as of FD 352).
- Check ground connection of return pump and of over-voltage-protection relay term. 31 for security and corrosion.
- Check hydraulic connections and joints on hydraulic modulator for leaks (visual examination).
- If the ABS indicator lamp comes on occasionally while driving (e.g. after the switching-on of electrical devices) and goes out again by itself, check battery and power supply (alternator, regulator and voltage drops).
- If the ABS indicator lamp is constantly lit and does not go out, check the following points:
 - Is multiple plug correctly seated on control unit and is it latched?
All plug-in contacts O.K.?
Spring contacts latched?
 - V-belt broken? (Alternator not supplying any voltage, charge-indicator lamp and ABS indicator lamp lit)
 - Alternator term. 61 supplying voltage?
Plug-in connection and lead to ABS control unit O.K.?
 - Perform check for loose contacts for wheel-speed sensors with program switch in position 10.



- For the test with the tester, switch on the ignition in all program-switch positions (tester uses power supply from vehicle battery).
- Watch tester lamps 1 and 2 in all program-switch positions.

Caution:

Do not drive with the tester connected.

After each repair, repeat the entire test program..

General note on trouble-shooting

Check all leads for short circuit to ground and for contact with positive leads and watch for wearing and pinching.

- Connect ABS tester to control unit and ABS wiring harness.

Caution:

Disconnect and connect control unit only with ignition off.

Installation position of control unit:
In luggage compartment on right under a cover.



3. RAPID DIAGNOSIS CHART FOR ABS TESTER

Switch on ignition for all program-switch positions.

<u>Program-switch position</u>	<u>Testing of</u>	<u>Additional operation</u>	<u>Test specification (Reading)</u>	<u>Cause of trouble</u>
1...24	Power supply in each test step	---	Lamp 1 (green) must be lit for each test step.	<ul style="list-style-type: none"> * Battery insufficiently charged. Repeat test step with engine running. * High voltage drops across the terminals (e.g. ground terminal). * Open circuit in ground connection.
1	Valve relay off-position	---	Lamp 1 (green) and lamp 3 (green) must be lit	<ul style="list-style-type: none"> * Open circuit or high contact resistance in leads (including ground lead) to valve relay. * Valve relay defective.
2	Valve relay operation	---	Lamp 1 (green) and lamp 3 (green) must be lit	
3	Motor relay off-position	---	Lamp 1 (green) and lamp 3 (green) must be lit	<ul style="list-style-type: none"> * Open circuit or high contact resistance in leads to motor relay * Motor relay defective. * Check pump motor for continuity.
4	Motor relay operation	Press illuminated key	Lamp 1 (green) and lamp 3 (green) must be lit; pump motor running.	

A5

Rapid diagnosis chart
Volvo 740/760



A6

Rapid diagnosis chart
Volvo 740/760



<u>Program-switch position</u>	<u>Testing of</u>	<u>Additional operation</u>	<u>Test specification (Reading)</u>	<u>Cause of trouble</u>
5	Overvoltage-protection relay (fuse and uni-directional-break-down diode only)	Switch off ignition. Disconnect control unit. Plug overvoltage-protection relay from vehicle into test socket on tester using adapter cable. Caution: Plug adapter cable into test socket turned through 180° and offset toward outside. Plug new overvoltage-protection relay into vehicle. Switch on ignition. Press illuminated key.	Lamp 1 (green) and lamp 3 (green) must be lit.	* The overvoltage-protection relay in the socket on the tester is defective. * Repeat test. Caution: Press illuminated key after more than 1 second.
6	Internal resistances of solenoid-operated valves in hydraulic modulator	Switch off ignition. Re-connect control unit. Switch on ignition. Press key FL Press key FR Press key RA	Lamp 1 (green) must be lit. FL: 0.7...1.7 Ω FR: 0.7...1.7 Ω RA: 0.7...1.7 Ω	* Open circuit or high contact resistances in leads to respective valve. * Hydraulic modulator defective.
7	Ground connection to term. 10	Press illuminated key	Lamp 1 (green) must be lit. 80 ... 300 mV	* Open circuit or high contact resistance in ground lead and ground terminal.
8	Ground connection to term. 34	Press illuminated key	Lamp 1 (green) must be lit. 10 ... 250 mV	
9	Ground connection to term. 20	Press illuminated key	Lamp 1 (green) must be lit. 10 ... 250 mV	

A7

Rapid diagnosis chart
Volvo 740/760

A8

Rapid diagnosis chart
Volvo 740/760


<u>Program - switch position</u>	<u>Testing of</u>	<u>Additional operation</u>	<u>Test specifications (Reading)</u>	<u>Cause of trouble</u>
10	Internal resistances of wheel-speed sensors	Press key FL Press key FR Press key RA	Lamp 1 (green) must be constantly lit FL: 0.6...1.6 kΩ FR: 0.6...1.6 kΩ RA: 0.6...1.6 kΩ	<ul style="list-style-type: none"> * Check for loose contact: Move all leads at fastening points, at plug and at wheel-speed sensor and watch reading. * Open circuit or high contact resistance in leads to respective wheel-speed sensor. * Respective wheel-speed sensor defective. * FA: If applicable, disconnect ETC control unit and repeat test. * RA: Disconnect control unit for signal conversion and repeat test.
11	Insulation resistances of wheel-speed sensors	Press key FL Press key FR Press key RA	Lamp 1 (green) must be constantly lit. FL: 20...999 kΩ FR: 20...999 kΩ RA: 20...999 kΩ	<ul style="list-style-type: none"> * Check leads to respective wheel-speed sensor for insulation damage. * Respective wheel-speed sensor defective. * FA: If applicable, disconnect ETC control unit and repeat test. * RA: Disconnect control unit for signal conversion and repeat test.
12	DC voltage on wheel-speed sensor leads	Press key FL Press key FR Press key RA	Lamp 1 (green) must be constantly lit. FL: 000...100 mV FR: 000...100 mV RA: 000...100 mV	<ul style="list-style-type: none"> * Check leads to respective wheel-speed sensor for contact (worn spot) with a positive lead. * Respective wheel-speed sensor defective. * FA: If applicable, disconnect ETC control unit and repeat test. * RA: Disconnect control unit for signal conversion and repeat test.

A9

Rapid diagnosis chart
Volvo 740/760


A10

Rapid diagnosis chart
Volvo 740/760



<u>Program-switch position</u>	<u>Testing of</u>	<u>Additional operation</u>	<u>Test specifications (Reading)</u>	<u>Cause of trouble</u>
13	Control unit internal supply voltage	Press illuminated key	8.85...9.15 V (Control unit 0 265 101 014) For generation 2B (control unit 0 265 101 013): 4.75...5.25 V	* Control unit defective.
14	Diode in forward direction and ABS indicator lamp		0.4...1.5 V ABS indicator lamp in vehicle must light up.	* Open circuit or contact resistance in leads to diode/indicator lamp. * Indicator lamp defective. * Diode (hydraulic modulator) defective.
15	Diode in reverse direction		2.5 ... 8.5 V ABS indicator lamp lit slightly dimmer.	* Diode (hydraulic modulator) defective.
16	Control unit BITE* triggering	Press illuminated key for 3 seconds	Indicator lamp must go out after max. 1 sec.	* Control unit defective. *BITE = Built-in test equipment
17	Control unit, BITE* fault simulation	Press illuminated key for 3 seconds	Indic. lamp must still be lit (flickering allow.)	* Control unit defective. *BITE = Built-in test equipment
18	Control unit, current for pressure-holding	Press key FL Press illum. key Press key FR Press illum. key Press key RA Press illum. key	FL: 1.9...2.3 A FR: 1.9...2.3 A RA: 1.9...2.3 A	* Control unit defective.
19	Control unit, current for pressure reduction	Press key FL Press illum. key Press key FR Press illum. key Press key RA Press illum. key	FL: 4.5...6.0 A FR: 4.5...6.0 A RA: 4.5...6.0 A	* Control unit defective
24	Voltage from stop-lamp switch	Actuate brake pedal	20 ... 15 V	* Leads to stop-lamp switch defective. * Stop-lamp switch defective. * Stop lamps defective.

A11

Rapid diagnosis chart

Volvo 740/760


A12

Rapid diagnosis chart

Volvo 740/760



For program-switch positions 20, 21, 22 and 23 a dynamic brake analyzer is required.
Do not drive with tester connected. For setting the braking force, do not use a
 brake-actuating device. Program-switch position 23 must come first.

Front axle

Drive front wheels of vehicle onto dynamic brake analyzer.

Pull on handbrake.

On vehicles with automatic transmission, set selector lever to position "N".

<u>Program-switch position</u>	<u>Testing of</u>	<u>Additional operation</u>	<u>Test specifications (Reading)</u>	<u>Cause of trouble</u>
23	Wheel-speed sensor signal	Press key FL, switch on left-hand brake roller. Press key FR, switch off left-hand brake roller, switch on right-hand brake roller.	<u>FL: 1.8 ... 19</u> <u>FR: 1.8 ... 19</u>	* Wheel-speed sensors mixed up? * Air gap too great. * Respective wheel-speed sensor defective * If applicable, disconnect ETC control unit and repeat test.
20	Hydraulic modulator-pressure reduction	Press key FR. Switch on right-hand brake roller. Press brake pedal and hold constant at <u>2000 N</u> . Press key FL. Switch off right-hand brake roller. Switch on left-hand brake roller. Hold constant at <u>2000 N</u> with brake pedal, press illuminated key.	<u>FR: 400 ... 1000 N</u> <u>FL: 400 ... 1000 N</u>	* Brake lines mixed up? * Conventional brake system O.K.? * Hydraulic modulator defective. <u>Note:</u> Replace hydraulic modulator only as a complete unit. Repair not allowed. Danger!
21	Hydraulic modulator - pressure buildup	Press key FL, switch on both brake rollers. Press brake pedal and hold constant at <u>2000 N</u> . Press illuminated key.	Left-hand reading of dynamic brake analyzer moves to an intermediate value and rises again to <u>FL: 1300 ... 1900 N</u>	

A13

Rapid diagnosis chart
Volvo 740/760



A14

Rapid diagnosis chart
Volvo 740/760



<u>Program-switch position</u>	<u>Testing of</u>	<u>Additional operation</u>	<u>Test specifications (Reading)</u>	<u>Cause of trouble</u>
21	Hydraulic modulator - pressure buildup	Press key FR. Switch on both brake rollers. Press brake pedal and hold constant at 2000 N. Press illuminated key.	Right-hand reading of dynamic brake analyzer moves to an intermediate value and rises again to <u>FR: 1300 ... 1900 N</u>	* Brake lines mixed up? * Conventional brake system O.K.? * Hydraulic modulator defective. <u>Note:</u> Replace hydraulic modulator only as a complete unit. Repair not allowed. Danger!
22	Hydraulic modulator - pump delivery	Switch on brake rollers. Read off inherent friction. Press key FA. Press brake pedal and hold constant at 2000 N. Press illuminated key.	After an intermediate reading on both sides, return pump switches on briefly. Reading on both sides must drop below <u>inherent friction plus 200 N.</u> Reading is shown only briefly.	* Hydraulic modulator defective. <u>Note:</u> Replace hydraulic modulator only as a complete unit. Repair not allowed. Danger!

Rear axle: Drive rear wheels of vehicle onto dynamic brake analyzer.

23	Wheel-speed sensor signal	Press key RA, switch on both brake rollers.	<u>RA: 1.8 ... 19</u>	* Wheel-speed sensors mixed up? * Air gap too great. * Respective wheel-speed sensor defective. * Disconnect control unit for signal conversion and repeat test.
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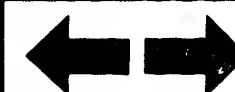
A15

Rapid diagnosis chart
Volvo 740/760



A16

Rapid diagnosis chart
Volvo 740/760



<u>Program-switch position</u>	<u>Testing of</u>	<u>Additional operation</u>	<u>Test specifications (Reading)</u>	<u>Cause of trouble</u>
20	Hydraulic modulator - pressure reduction	Press key RA. Switch on both brake rollers. Press brake pedal and hold constant at 2000 N. Press illuminated key.	RA: 300 ... 1000 N	* Brake lines mixed up? * Conventional brake system O.K.? * Hydraulic modulator defective. <u>Note:</u> Replace hydraulic modulator only as a complete unit. Repair not allowed. Danger
21	Hydraulic modulator - pressure buildup	Press key RA, switch on both brake rollers. Press brake pedal and hold constant at 2000 N. Press illuminated key	Reading of brake analyzer for both sides moves to an intermediate value and rises again to RA: 1000 ... 1800 N	
22	Hydraulic modulator - pump delivery	Switch on brake rollers. Read off inherent friction. Press key RA. Press brake pedal and hold constant at 2000 N.	After an intermediate value on both sides, return pump switches on briefly. Reading on both sides must drop below inherent friction plus 200 N. Reading is shown only briefly.	* Hydraulic modulator defective. <u>Note:</u> Replace hydraulic modulator only as a complete unit. Repair not allowed. Danger!

Finally, perform a road test.

With the engine running, the indicator lamp must go out.

Drive at at least 30 km/h.

The indicator lamp must not come on again.

A17

Rapid diagnosis chart

Volvo 740/760

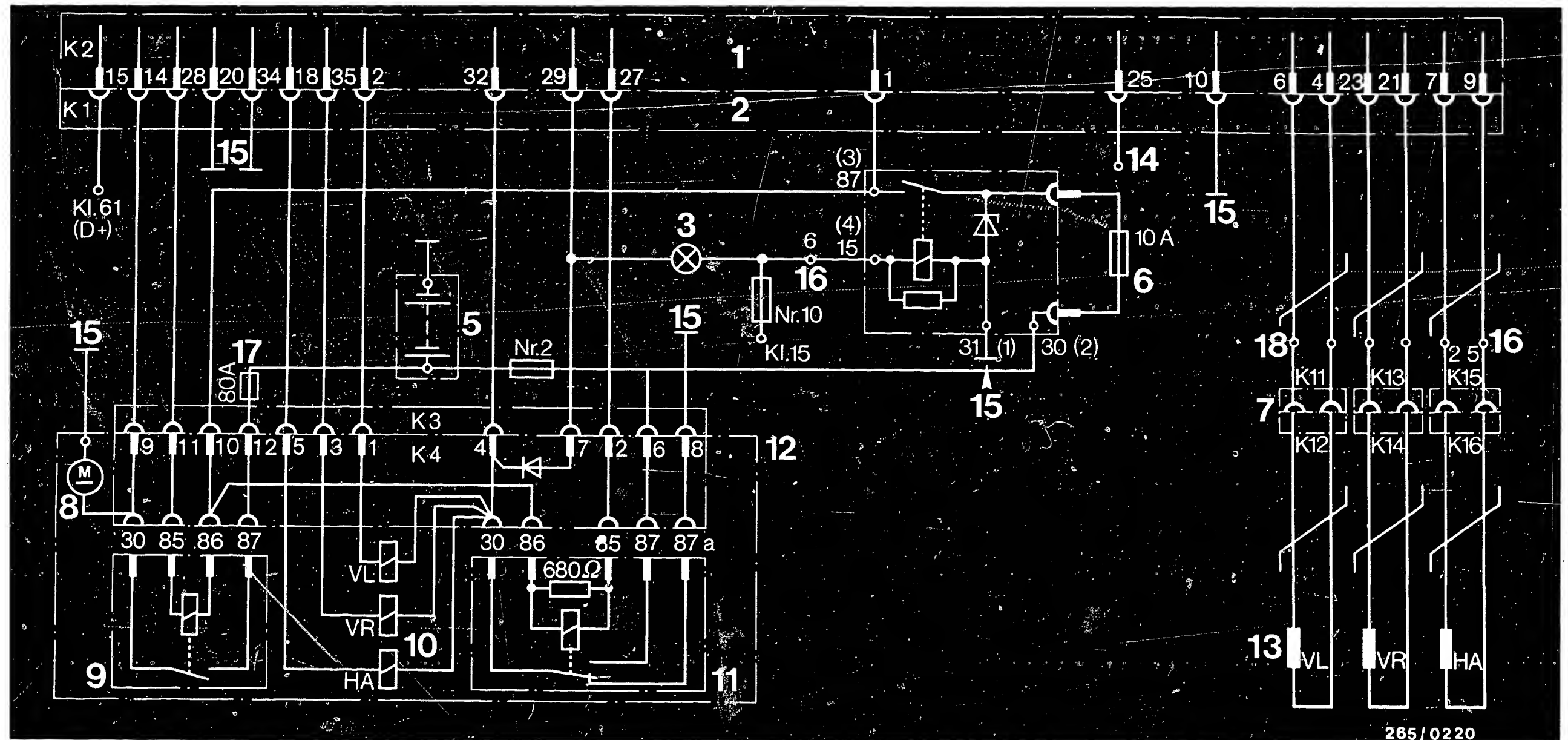


A18

Rapid diagnosis chart

Volvo 740/760





4. ELECTRICAL TERMINAL DIAGRAM

- | | | |
|----------------------------------|--|---|
| 1 = Electronic control unit | 9 = Motor relay | 17 = Fuse box |
| 2 = Multiple plug (35-pin) | 10 = Solenoid-operated valves | 18 = Terminals on ETC control unit
(if applicable) |
| 3 = ABS indicator lamp | 11 = Valve relay | HA = RA = Rear axle |
| 4 = Overvoltage-protection relay | 12 = Hydraulic modulator | K1 to K16 = ABS plug connectors |
| 5 = Battery | 13 = Wheel-speed sensor | VL = FL = Front left |
| 6 = Plug-in fuse | 14 = To stop-lamp switch (+) | VR = FR = Front right |
| 7 = Cable connector | 15 = Ground terminal on right-hand tail lamp | |
| 8 = Return-pump motor | 16 = Terminals on signal convertor | |

A19

Electrical terminal diagram
Volvo 740/760



A20

Electrical terminal diagram
Volvo 740/760

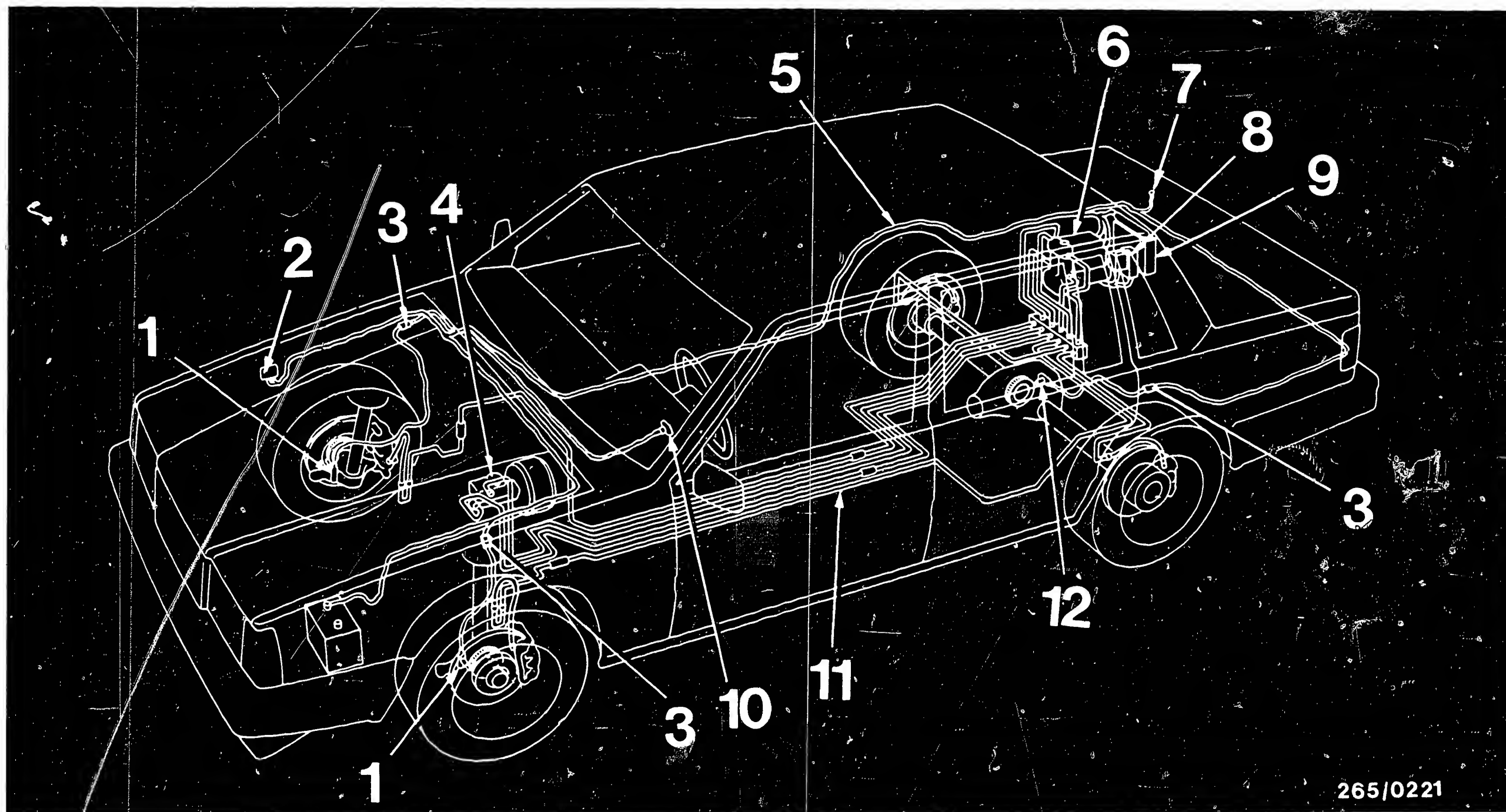


5. INSTALLATION POSITION OF COMPONENTS

The indications "right" and "left" always apply as viewed in the forward direction of travel.

- * ABS indicator lamp: In instrument panel
- * ABS fuse box: In engine compartment on right-hand spring-strut crown .
- * Front-axle wheel-speed sensors: One each on left and right in steering knuckles.
- * Rear-axle wheel-speed sensor: Only 1 wheel-speed sensor on rear-axle housing.
- * Hydraulic modulator: In luggage compartment on right.
- * Ground terminal for ABS: In luggage compartment on right-hand tail lamp.
- * Control unit: In luggage compartment on right.
- * Overvoltage-protection relay: In luggage compartment on right.
- * Control unit for electronic traction control (ETC, if applicable): In passenger compartment next to pedal block.
- * Control unit for signal conversion: In luggage compartment on right.





265/0221

Installation position of components (continued)

- 1 = Front-axle wheel-speed sensor
- 2 = ABS fuse box
- 3 = Wheel-speed sensor plug connectors
- 4 = Brake assembly with brake master cylinder

- 5 = ABS wiring harness
- 6 = Hydraulic modulator
- 7 = Ground terminal
- 8 = Overtoltage-protection relay

- 9 = Control unit
- 10 = Indicator lamp
- 11 = Brake lines
- 12 = Rear-axle wheel-speed sensor

A22

Installation position of components
Volvo 740/760



A23

Installation position of components
Volvo 740/760



6. TEST EQUIPMENT AND TOOLS

Description	Designation	Part Number
<u>ABS tester</u> Use only converted testers. Identification "U2" on nameplate or as of FD 352	ETT 016.00	0 684 101 600
<u>Adapter cable</u> For connection of overvoltage-protection relay		1 684 460 120
<u>Dynamic brake analyzer</u>	e.g. BPS 100 or BPS 101 or BPS 104 or BPS 105	0 680 012 .. 0 680 013 .. 0 680 018 .. 0 680 019
<u>Charging and bleeding device</u>		e.g. ATE Part No. 3.9302-1000.4 ¹⁾
<u>Bleeder fitting</u> For connection of charging and bleeding device to fluid reservoir of master cylinder		ATE Part No. 3.9302.0702.2 ¹⁾
<u>Bleeder hose</u>		ATE Part No. 3.3590.2300.1 ¹⁾
<u>Auxiliary hose</u>		ATE Part No. 3.9302.0704.2 ¹⁾
<u>Brake-pedal-actuating device</u>		ATE Part No. 3.9312.0100.4 ¹⁾

1) obtainable from: Alfred Teves GmbH
Guerickestraße 7
6000 Frankfurt/Main

B1

Test equipment and tools

Volvo 740/760



Description	Designation	Part Number
Pressure tester Tester for low- and high-pressure testing of hydraulic brake systems		e.g. ATE Part No. 3.9305-0200.4 1)
Double box wrench, open 9 x 11 mm		Hazet Part No. 612 2)
<u>Vessel</u> For catching brake fluid approx. 1 l <u>Brake fluid:</u> DOT 4 or SAE J 1703		
Electric tester or Multimeter for trouble-shooting	ETE 014.00	0 684 101 400 commercially available

6.1 Aids

Use only genuine brake lines from Volvo.

Description		Part Number
Grease for wheel- speed sensors		Molykote Longterm 2
Protective cap for brake lines		1 900 508 002 (100 pieces)
Protective caps for brake-line connec- tions on hydraulic modulator		1 900 508 004 (100 pieces)

1) Obtainable from: Alfred Teves GmbH
Guerickestraße 7
6000 Frankfurt/Main

2) Hazet 5630 Remscheid

B2

Test equipment and tools
Volvo 740/760



7. BLEEDING OF BRAKE SYSTEM

After replacing the hydraulic modulator, bleed brake system and perform high-pressure and low-pressure tests.

Take care when handling brake fluid!

- a) Only pour brake fluid into containers where there is no danger of accidental human consumption of the fluid (Warning: Poisonous)
- b) Even slight traces of mineral oil cause the brake system to fail. If the brake fluid is colorless or yellowish pay particular attention since in this case the danger of a mix-up is at its greatest. If mineral oil is detected in the brake system or if there is a suspicion of same, the entire brake system must be thoroughly rinsed with brake fluid. The brake master cylinder must also be replaced.
- c) Do not allow brake fluid to come into contact with the vehicle paintwork as it contains components which dissolve paint.
- d) Brake fluid is highly hygroscopic, i.e. it absorbs humidity thus reducing the boiling point. Thus, brake fluid may only be stored in thoroughly sealed containers.

Note:

In the course of its service life the boiling point of the brake fluid drops due to the continuous absorption of humidity from the atmosphere. Thus, vapor bubbles may form in the brake system if the brakes are subjected to extremely heavy braking conditions. The brake fluid must therefore be replaced annually, preferably in the spring.

B3

Bleed brake system
Volvo 740/760



Bleeding

- When using a bleeding device for bleeding, pay attention to the manufacturer's operating instructions. In order to eliminate all air bubbles from the tandem brake master cylinder, the brake pedal must be completely depressed at least three times during the bleeding process with the bleeder screws open.
- If bleeding is performed by "pumping" with the brake pedal, close the appropriate bleeder screw each time before releasing the brake pedal to prevent air from being sucked in via the thread of the bleeder screw.
- Slowly release brake pedal to ensure that sufficient brake fluid is sucked in from the fluid reservoir during the return stroke of the plunger.
- The bleeding process is complete when clear, bubble-free brake fluid emerges via the bleeder hose.

Important!

The brake fluid pumped out during bleeding may not be reused since it may contain foreign matter which would then get back into the brake system.

- Fill fluid reservoir with brake fluid as far as "max" mark.



8. CHECKING THE BRAKE SYSTEM FOR LEAKS

	<u>High-pressure test</u>	<u>Low-pressure test</u>
Line test pressure Gauge pressure	50 ... 90 bar	3 bar
Test duration	5 minutes	2 minutes
Pressure drop of set value	5 % (max.)	0 %

Note

The leakage check, which must be performed in both brake circuits, comprises high-pressure and low-pressure testing.

B5

Leak check

Volvo 740/760



8.1 High-pressure test

- Connect pressure tester to fixed caliper. To do this, unscrew bleeder screw and screw in fitting. Then bleed pressure tester.
- Allow engine to run at medium speed and generate as high a vacuum as possible by suddenly releasing the accelerator pedal.
- Using the brake-pedal actuating device depress the brake pedal until a line pressure of between 50 and 90 bar gauge pressure is generated, then secure brake pedal in this position.
- During the test period of 5 minutes, the pressure drop may not be greater than 5 % of the set value. If the pressure drop is greater than this figure the leak must be sought and eliminated, or the hydraulic modulator must be replaced.

8.2 Low-pressure test

- Release brake pedal actuating device until a line pressure of 3 bar gauge pressure is indicated on the pressure gauge.
- During a test period of 2 minutes the set pressure may not drop. If a drop in pressure is detected, the leak must be sought and eliminated, and the brake master cylinder or the hydraulic modulator must be replaced.

B6

Leak check

Volvo 740/760



9. GENERAL NOTES ON REPAIR WORK AND BRAKE SYSTEM

The ABS is basically maintenance-free, but when performing work on ABS-equipped vehicles, pay attention to the following:

1. If welding work is to be performed with an electric welding unit, the electronic controller plug must be removed.
2. During painting work the electronic controller may be subjected to a maximum of 95°C for brief periods and a maximum of 85°C for lengthy periods (approx. 2 hours).
3. After replacement of the hydraulic modulator, controller, wheel-speed sensors and wiring harness as well as work involving the ABS assemblies (e.g. work performed after accidents), the entire ABS system must be checked using the tester. Make absolutely sure that the brake lines are laid correctly.
4. After any work on the brake system, the brake system must be bled and high-pressure as well as low-pressure testing performed. All junctions are to be checked for leaks.
5. If the battery has been removed, the cable clamps at the two terminals must be properly tightened after re-installation.
6. Do not use a fast charger for starting the engine.
7. Never disconnect the battery from the vehicle electrical system with the engine running.



8. Disconnect the battery from the vehicle electrical system when fast charging.

9. Make sure that all connectors of the wiring harness are securely connected.

10. Never connect or disconnect the wiring-harness plug of the controller with the ignition switched on.

11. For safety reasons, the hydraulic modulator must not be repaired, but the complete unit must be replaced.

Exceptions to this are the return-pump relay and the valve relay. Both relays may be replaced.

No screws on the hydraulic modulator may be loosened apart from the brake-line connections. After loosening it is no longer possible to get the brake circuits leak-tight! Danger!



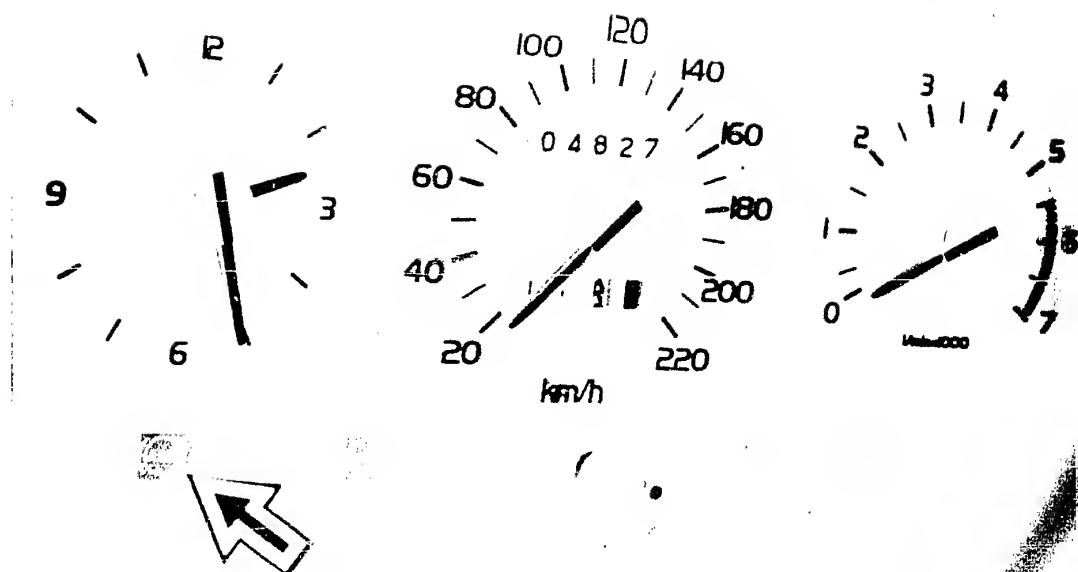
10. Function and checking of ABS indicator lamp

Vehicles equipped with ABS come into the workshop with one of the following customer complaints:

- Indicator lamp not lighting up after switching on the ignition.
- Indicator lamp does not go out after reaching idle speed (applies to control unit 0 265 101 013) or does not go out after reaching a vehicle speed of approx. 6 km/h (applies to control unit 0 265 101 014).
- Indicator lamp lighting up again when driving or lighting up occasionally.

Confirm the complaint yourself before checking the entire ABS system with the ABS tester. For reasons of safety, the ABS may only be checked using the ABS tester. The ignition must always be off for connecting the ABS tester as well as when connecting or disconnecting the controller. If you have detected a fault with the ABS tester, always disconnect the controller before performing further trouble-shooting. In the following you are informed of the correct function and malfunction of the ABS indicator lamp.





265/0222

Arrow = ABS indicator lamp

10.1 Operation of ABS indicator lamp

When the ignition is switched on, the indicator lamp identified by the letters "ABS" lights up. For control unit 0 265 101 013 the following applies:

After starting and reaching idle speed, the ABS indicator lamp goes out (terminal 61 of alternator supplying voltage to ABS control unit).

For control unit 0 265 101 014 the following applies:

After reaching a vehicle speed of approx. 6 km/h the indicator lamp goes out.

When, for the first time after starting, the vehicle exceeds a speed of approx. 6 km/h with all 4 wheels, the ABS system performs a self-check (BITE sequence). This is repeated each time the ignition is switched on and the engine is started again.

In addition, the ABS constantly checks itself to a certain extent while the vehicle is in motion.

B10

Check ABS indicator lamp

Volvo 740/760



Incorrect indicator lamp indications are:

- Indicator lamp not lighting up after switching on the
- Indicator lamp does not go out after reaching idle speed or after reaching a vehicle speed of approx. 6 km/h.
- Indicator lamp lights up again while driving or lights up occasionally.

The lighting up of the ABS indicator lamp tells the driver that the ABS is not in working order. Nevertheless, the conventional brake system is still available. However, locking of the wheels is possible.

General note

Occasional lighting up of the indicator lamp may be caused by an insufficiently charged battery. The lamp only lights up as long as there is undervoltage, e.g. after switching on loads at idle.

The causes of trouble are to be established with the aid of the ABS tester and a dynamic brake analyzer.



10. ABS TESTER

The tester checks functions of the controller, of the hydraulic modulator, of the wiring harness and also checks the components of the antiskid system (ABS).

The ABS tester measures actual values which are compared with the respective nominal values.

If the actual value indicated differs from the nominal value, carry out trouble-shooting as directed in the "trouble-shooting" column.

Connect the ABS tester between the controller and the ABS wiring harness (switch off the ignition to connect the tester).

Do not drive the vehicle with the tester connected.

The respective test steps are set with the program-selector switch (1 to 24).

For the wheel-speed sensors and the hydraulic modulator depress the round buttons according to the test chart.

Test steps with a high power requirement are not triggered until after the illuminated key has been pressed.

The illuminated key lights up automatically in the respective test steps.

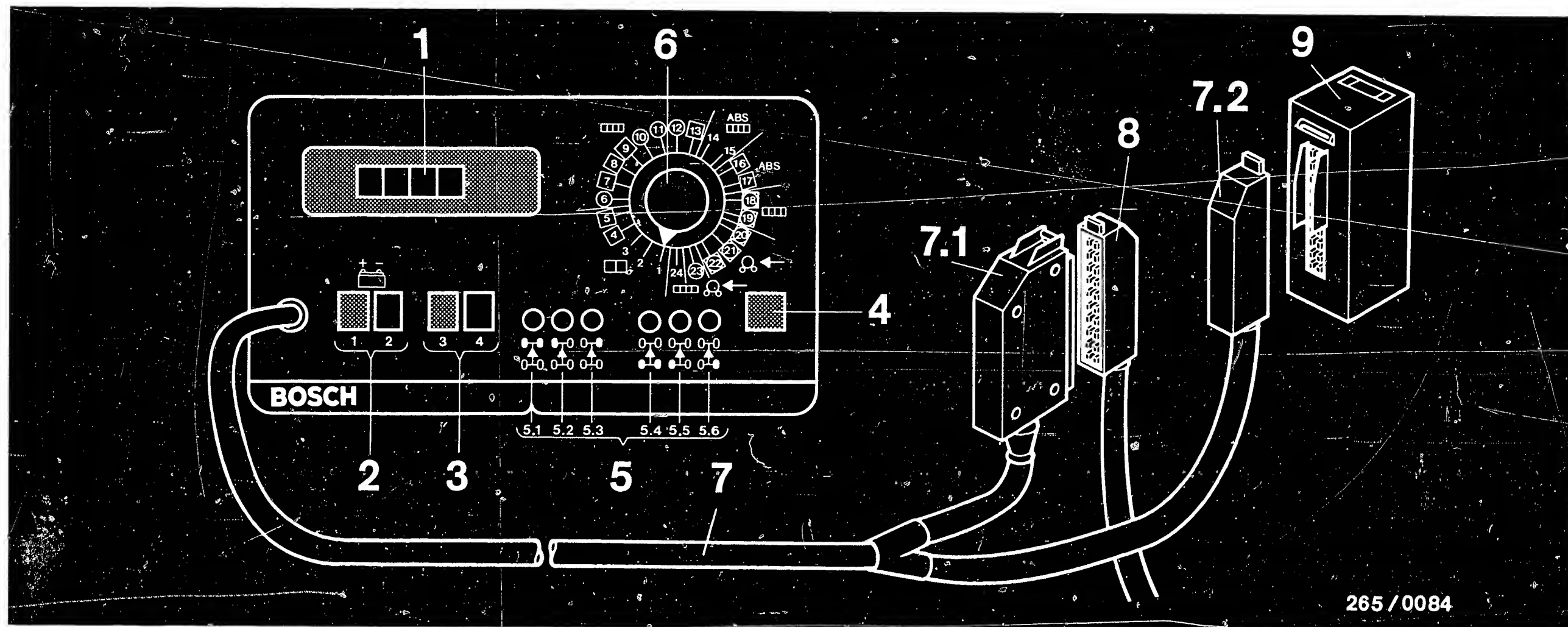
The actual value is indicated either by the green-red lamps or by the digital display.

The test steps with the program-selector switch in positions 20...23 can only be performed on a dynamic brake analyzer.

For generations 2B it is absolutely necessary that the tester has been converted to meet the latest requirements.

Note identification "U2" or FD greater than 352 on name-plate.





265 / 0084

ABS tester

- 1 = Digital LED display unit
- 2 = Lamp 1 (green): battery voltage O.K.
- 3 = Lamp 2 (red): battery voltage too low
- 4 = Lamp 3 (green): return-pump relay and valve relay as well as overvoltage protection O.K.
- Lamp 4 (red): return-pump relay and valve relay as well as overvoltage protection defective
- 5 = Channel selection key (wheel selection)
- 5.1 = Front axle (FA)

- 5.2 = Front left wheel (FL)
- 5.3 = Front right wheel (FR)
- 5.4 = Rear axle (RA)
- 5.5 = Rear left wheel (RL)
- 5.6 = Rear right wheel (RR)
- 6 = Program-selector switch
- 7 = Connecting cable
- 7.1 = Connection to wiring harness
- 7.2 = Connection to controller
- 8 = Multiple plug of vehicle wiring harness
- 9 = ABS controller (installed in vehicle)

B13

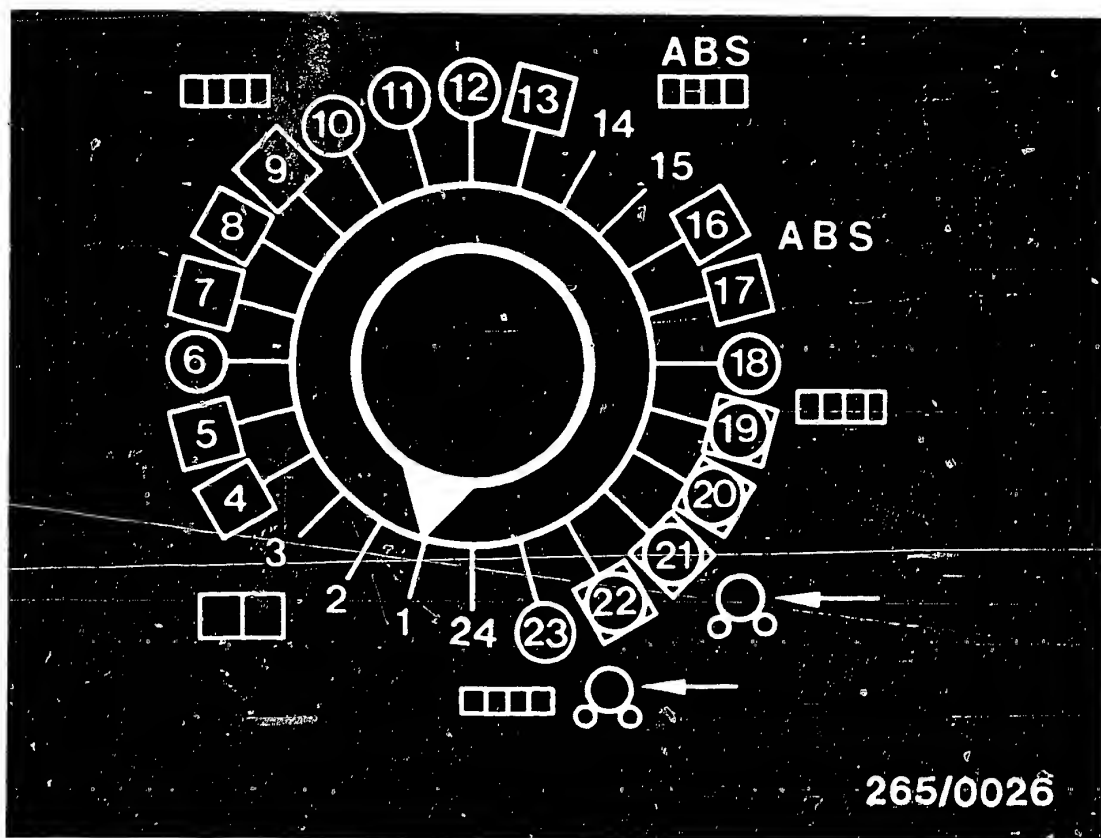
ABS tester
Volvo 740/760



B14

ABS tester
Volvo 740/760





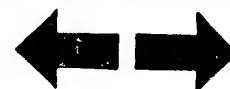
Program-selector switch (description of symbols)

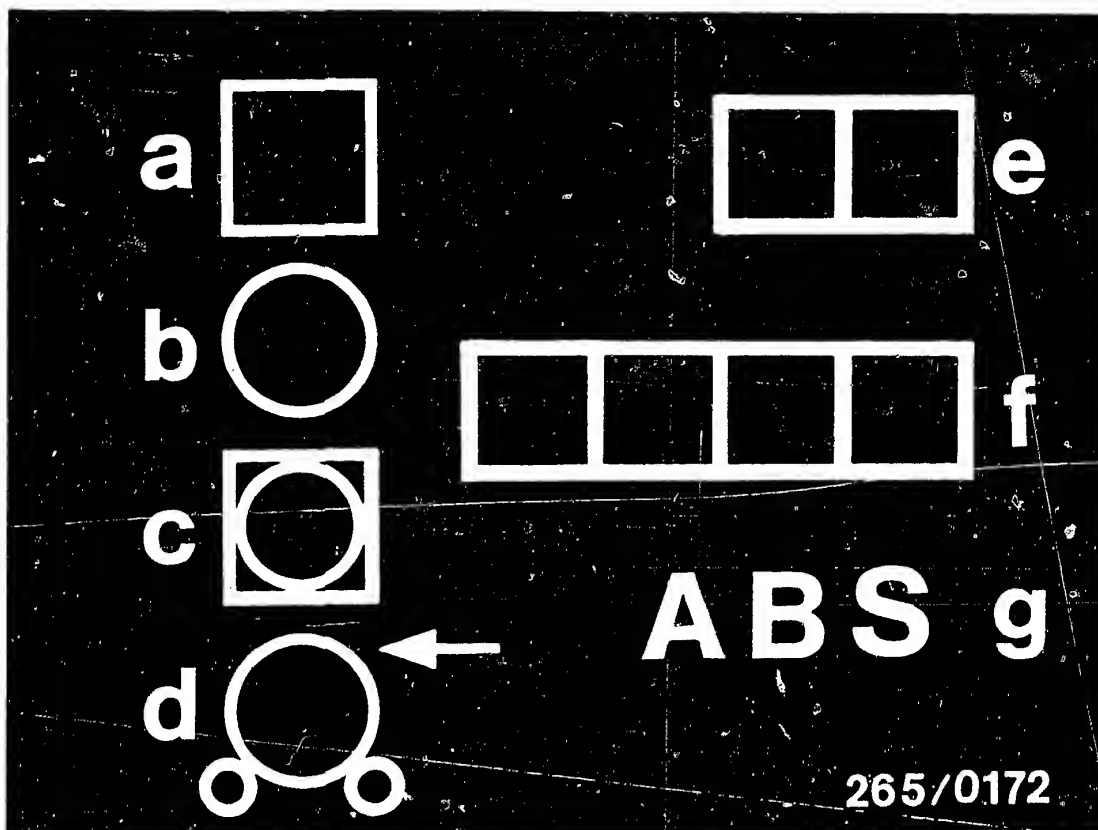
Program-selector switch for 24 program steps

B 15

ABS tester

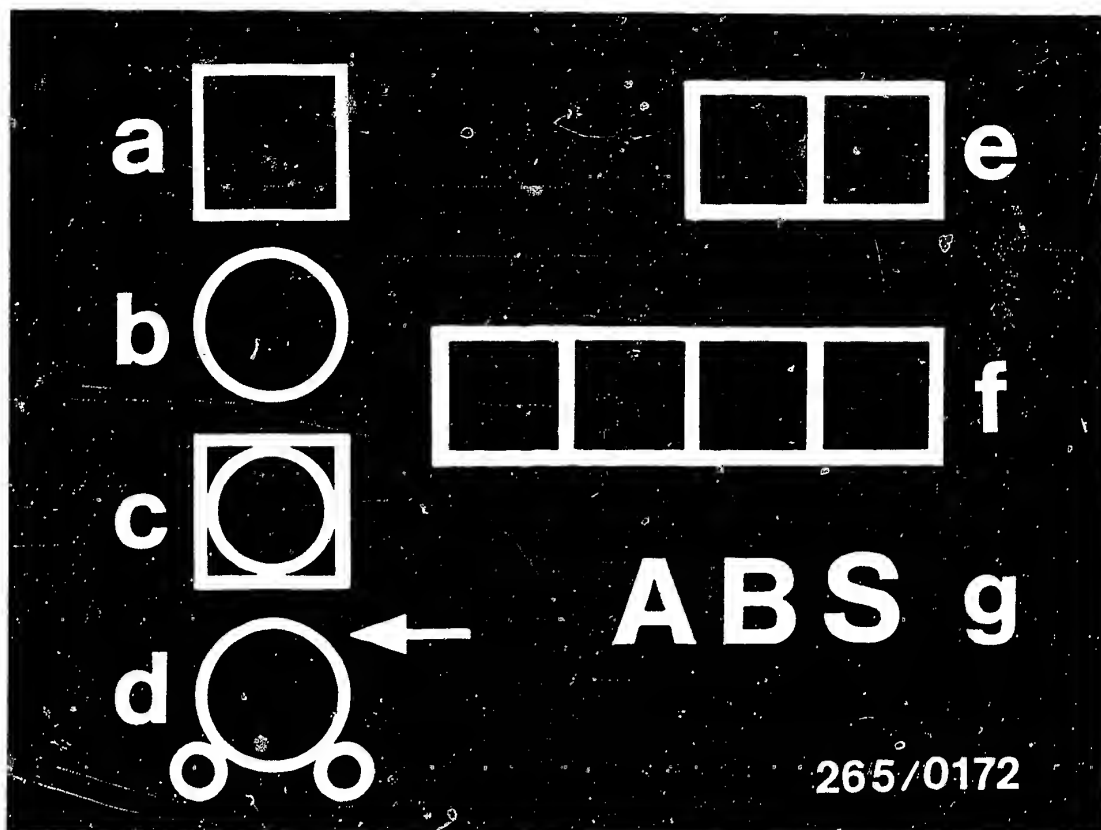
Volvo 740/760





Symbols for additional operation:

- a = Press illuminated key (Item 4)
- b = Press respective keys for channel selection (Items 5.1 to 5.6)
- c = Press key for channel selection (Items 5.1 to 5.6). Press illuminated key (Item 4).
- d = Drive front and rear axles of vehicle one after the other onto brake analyzer.

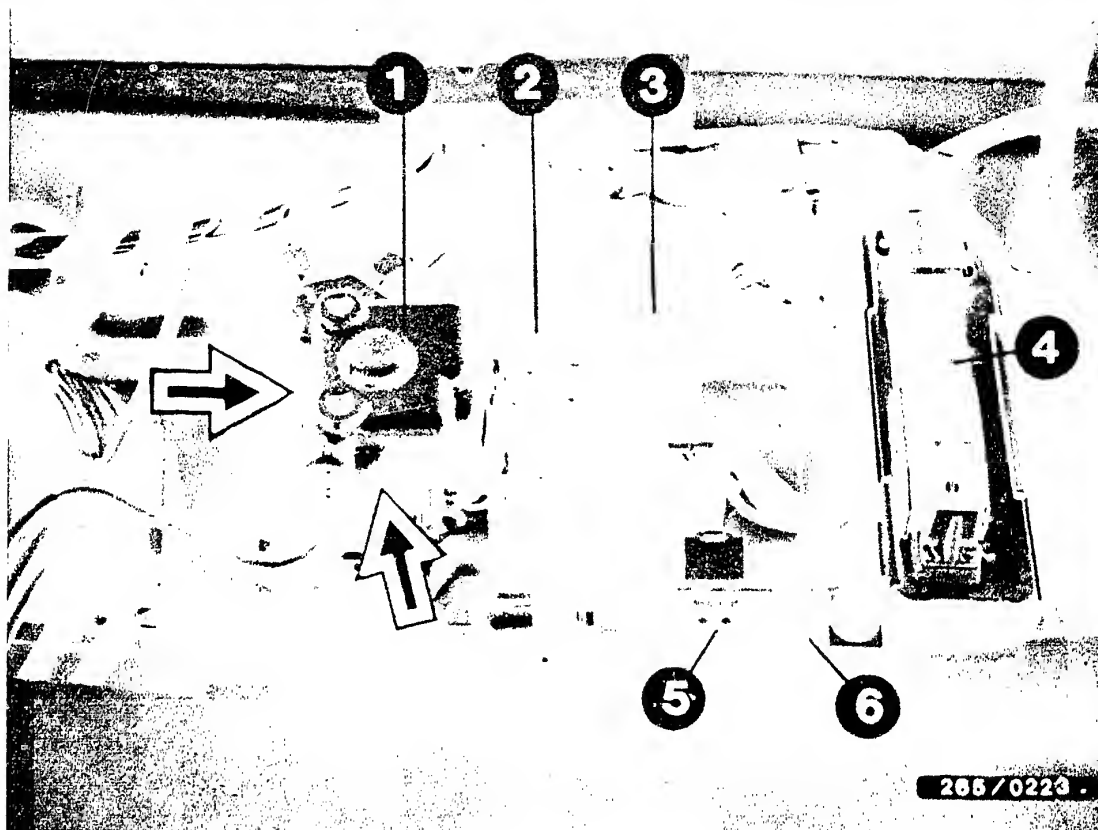


e = Red-green indicator, lamp units (Items 2 and 3)

f = Digital display unit (Item 1)

g = Watch indicator lamp in vehicle.





1 = Hydraulic modulator
Arrows = Joints

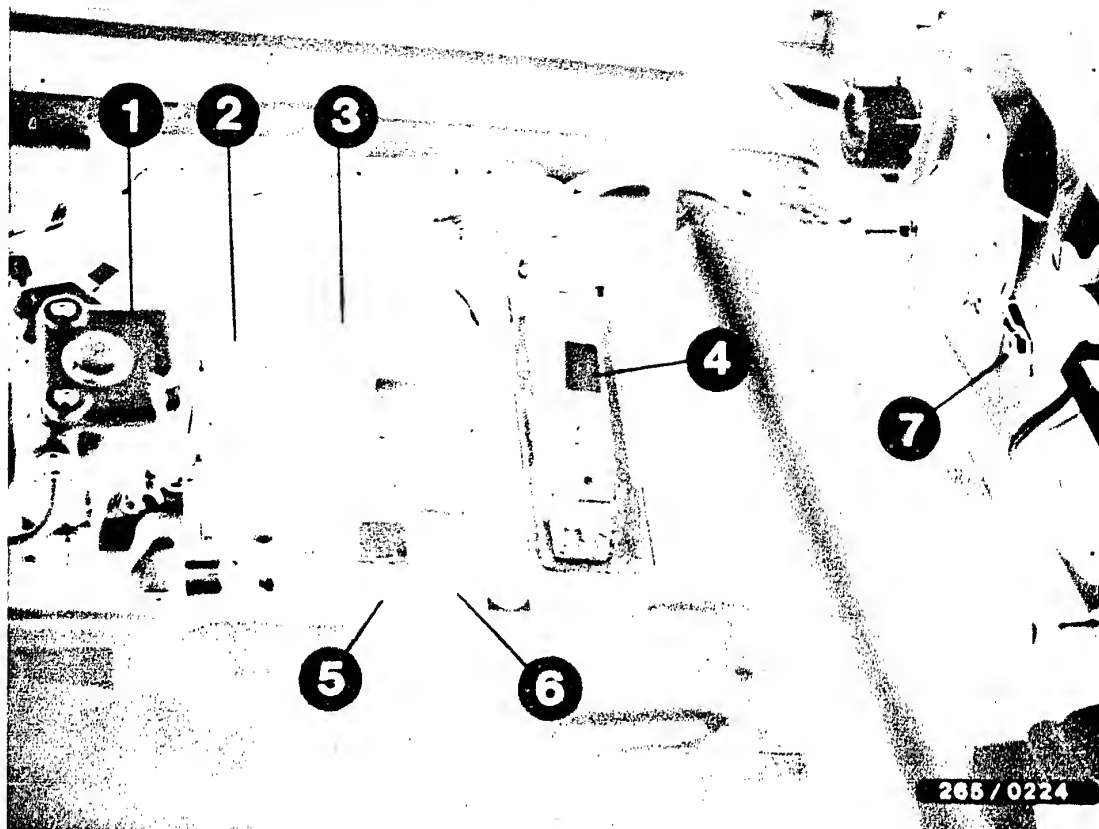
12. TEST CONDITIONS FOR TESTING WITH ABS TESTER

- Test ground connection of return pump and ground connection of valve relay for security.
- Test hydraulic connections on hydraulic modulator and joints (arrows) for leaks (visual examination).



- If the ABS indicator lamp lights up occasionally when driving (e.g. after switching on loads) and goes out again automatically, check the battery and the power supply (generator, regulator and voltage drops).
- If the ABS indicator lamp lights up constantly and does not go out, check the following points:
 - Is the multiple plug correctly fitted to the controller and has it locked in position?
Are all plug contacts OK? Have the spring contacts locked in position?
 - Has the V-belt broken? (generator not providing any power, charge indicator lamp and ABS indicator lamp light up).
 - Is there voltage at generator terminal 61?
Plug connector and cable to ABS controller OK?
 - Disconnect control unit for signal conversion (for speedometer reading). Perform road test up to 30 km/h. If ABS indicator lamp now not lit, replace control unit for signal conversion.
 - If applicable, disconnect control unit for electronic traction control.
Perform road test up to 30 km/h. If ABS indicator lamp now not lit, continue trouble-shooting with electronic traction control (ETC).
 - Pay particular attention to loose-contact test for wheel-speed sensors with program switch in position 10.





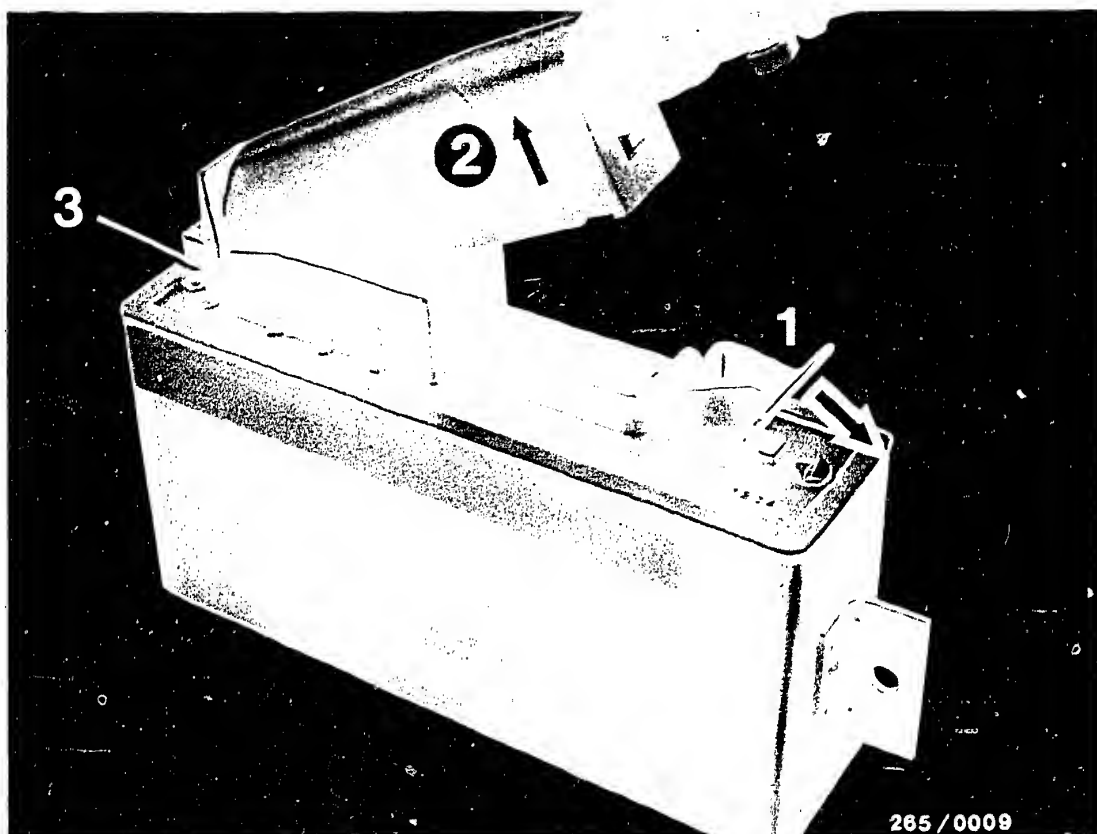
- | | |
|----------------------------------|--|
| 1 = Hydraulic modulator | 6 = Control unit for signal conversion |
| 4 = ABS control unit | |
| 5 = Overvoltage-protection relay | 7 = ABS ground terminal |

- Connect ABS tester to controller and ABS wiring harness.

Caution

Connect and disconnect controller only with ignition off.

Installation position: The control unit is installed in the luggage compartment under the right-hand spare-wheel well.



- 1 = Spring
- 2 = Multiple plug (35-pin)
- 3 = Encoding block

Switch off ignition before disconnecting multiple plug.

Press back spring, hinge up multiple plug and unhook from encoding block.

- For testing with the tester, switch on the ignition in all program-selector switch positions (tester operates on power supply from vehicle battery)
- Watch tester lamps 1 and 2 in all program-selector switch positions.

Caution!

Do not drive the vehicle with the tester connected!

Repeat the entire test program after any repairs.

General note on trouble-shooting

Check all cables for short circuit to ground and for contact with positive cables, and watch for any indications of wear, abrasion and pinching.



13. TEST WITH ABS TESTER

Note:

In the following test steps, the additional frame around parts of the text indicates which operation has to be changed in comparison with the preceding test step.

C1

Test with ABS tester

Volvo 740/760



TEST STEP 1 Note: This test step is important for all the following test steps, i.e. watch lamps 1 and 2 throughout the entire test procedure.

<u>Operation:</u>		<u>Reading:</u>	<u>Testing:</u>
Program-selector switch position	1 to 24	Lamp 1 (green) must light up	Component: Power supply
<u>Operation in vehicle:</u> Switch on ignition		<u>Note:</u> Lamp 1 (green) = OK. Lamp 2 (red) = fault Watch for occasional lighting up.	<u>Operation:</u> Monitoring of power supply in all program-selector switch positions.
		<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> yes ↓ Continue testing with next test step. </div> <div style="text-align: center;"> no ↓ </div> </div>	<u>Malfunction:</u> 1. No reading 2. Green lamp goes out and red lamp lights up, possibly only briefly as long as there is undervoltage.

Trouble-shooting (switch off ignition):

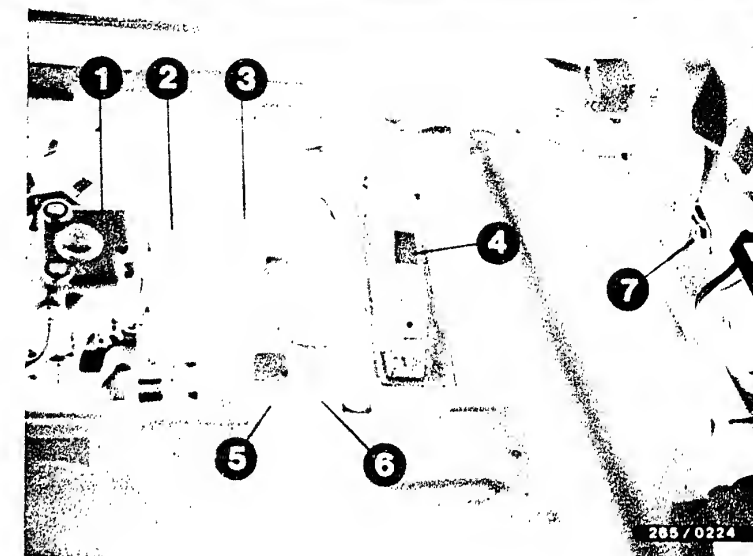
1. No reading:

- Fuses no. 2 and no. 10 in fuse box defective.
- Multiple plug not correctly connected.
- Plug-in fuse in overvoltage protection relay defective.
- Overvoltage protection relay defective - replace.

Check the following leads:

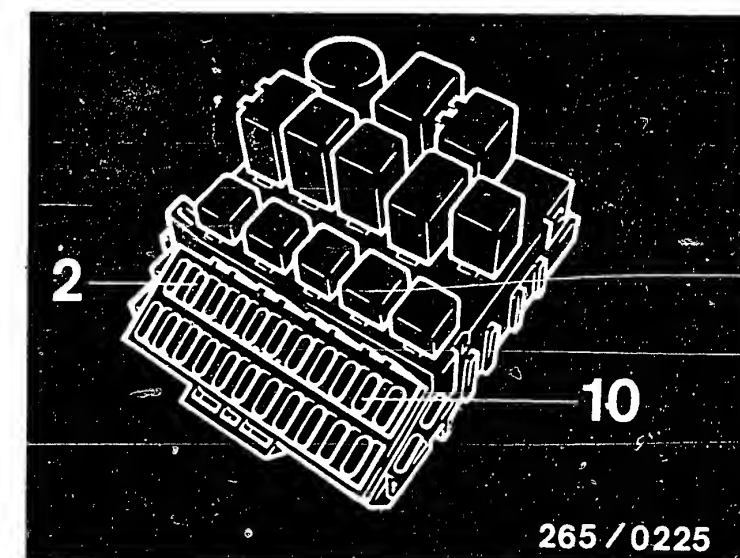
- Positive lead from B+ to overvoltage protection relay term. 30.
- Negative lead from overvoltage protection relay term. 31 to ground.

Continued on C 4/C 5



Installation position for
5 = Overvoltage-protection relay
6 = Control unit for signal conversion
7 = ABS ground terminal

Central-electrics box behind ashtray on center console
2 and 10=Fuses no. 2 and no. 10



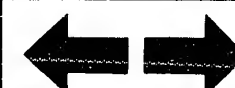
C2

Test with ABS tester
Volvo 740/760



C3

Test with ABS tester
Volvo 740/760



Trouble-shooting from TEST STEP 1 (continued)

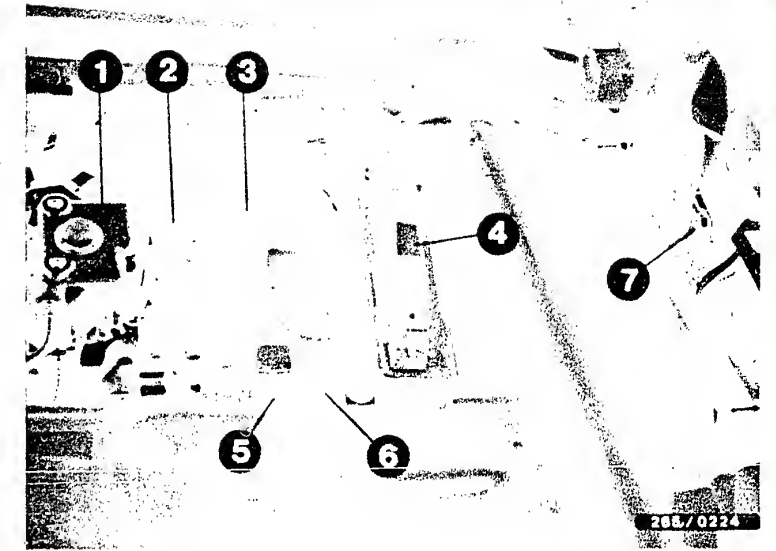
- Negative lead from overvoltage-protection relay term. 31 to multiple plug term. 10.
- ABS ground terminal must be bare down to the metal and must have no contact resistance.
- Positive lead from overvoltage protection relay term. 87 (3) to multiple plug term. 1.
- Positive lead from overvoltage protection relay term. 15 (4) to driving switch term. 15.

Lamp 2 (red) lights up or lights up occasionally during testing:
Stop test and eliminate cause of trouble.

Causes of trouble:

1. Battery insufficiently charged. Charge battery or let engine run.
2. High voltage drops across ABS ground terminals:
Ground terminals must be bare down to the metal.

After remedying fault, perform complete test program.



Installation position for
5 = Overvoltage-protection relay
6 = Control unit for signal conversion
7 = ABS ground terminal

C4

Test with ABS tester
Volvo 740/760

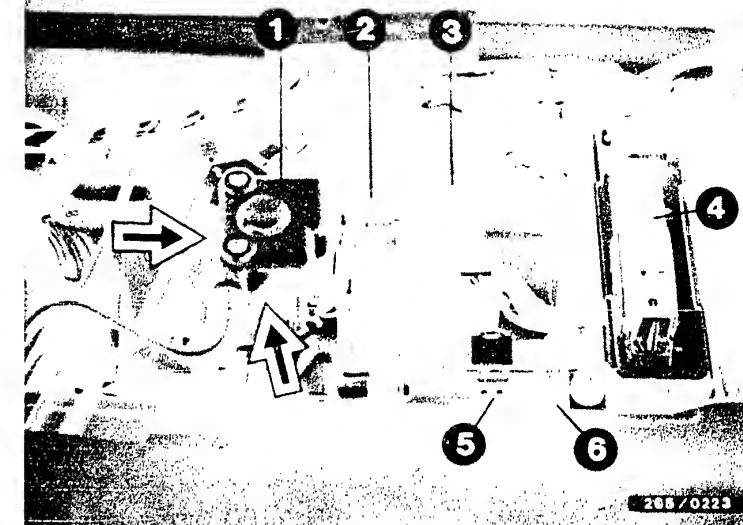


C5

Test with ABS tester
Volvo 740/760



TEST STEP 2		Reading:	Testing:
Operation:			
Program-selector switch position	1	Lamp 3 (green) must light up	Component: Valve relay
Operation in vehicle:			Operation: Off-position
Switch on ignition		<div>yes</div> <div>Continue test- ing with <u>next</u> test step.</div>	Malfunction: Lamp 4 (red) lights up
		no	



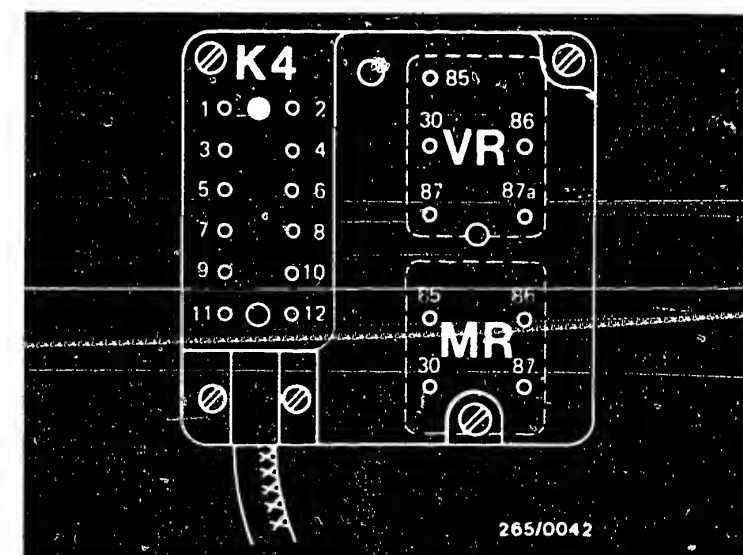
1 = Hydraulic modulator
2 = Valve relay
3 = Motor relay

Top view of plug-in plate of
hydraulic modulator
VR = Valve relay
MR = Return-pump relay
K4 = Wiring harness plug

Trouble-shooting (switch off ignition):

- Valve relay defective.
Caution! Use only relay with correct electrical terminal assignment.
- Ground connection has high contact resistance or open circuit.
- Test the following cables for continuity:
From ground to plug K 3/term.8
From K4/term.8 to valve relay term.87 a
From K4/term. 4 to valve-relay plug term.30
From K3/term. 4 to multiple plug K1/term.32

Continued on C 8



C6

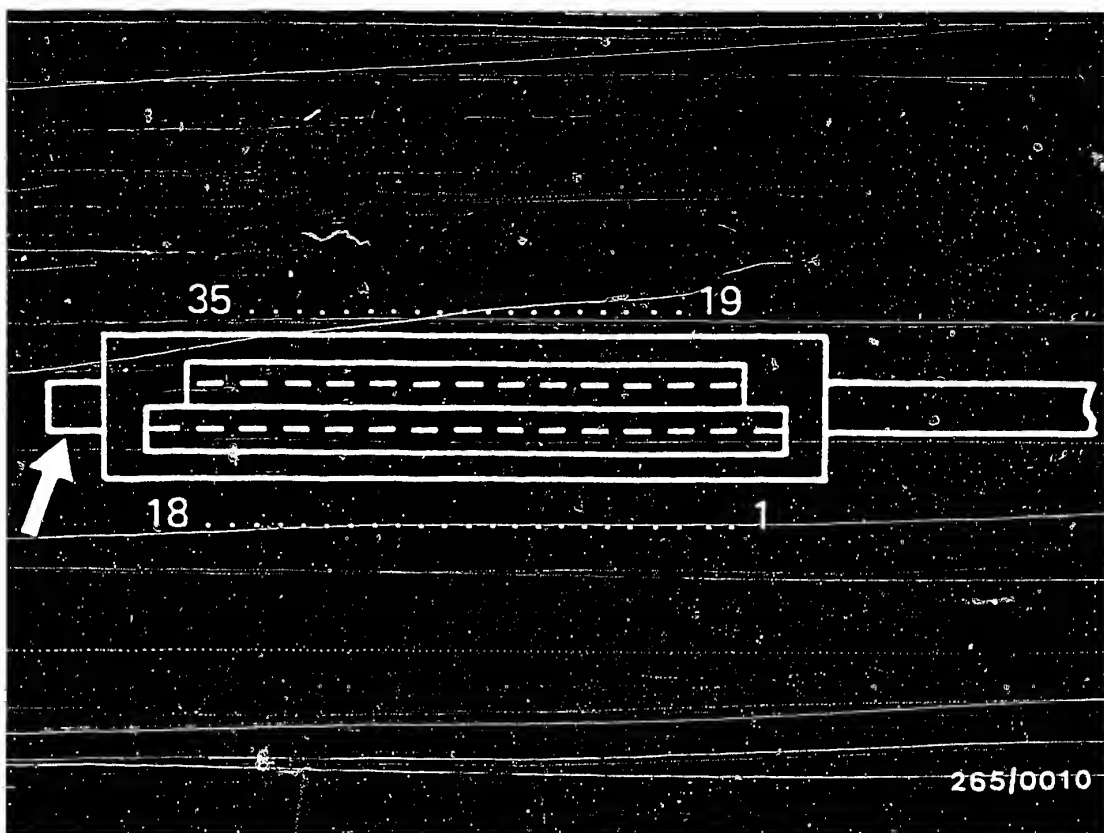
Test with ABS tester
Volvo 740/760



C7

Test with ABS tester
Volvo 740/760





265/0010

Trouble-shooting for TEST STEP 2 (continued)

Top view of multiple plug K 1 (35-pin) with terminal numbers.

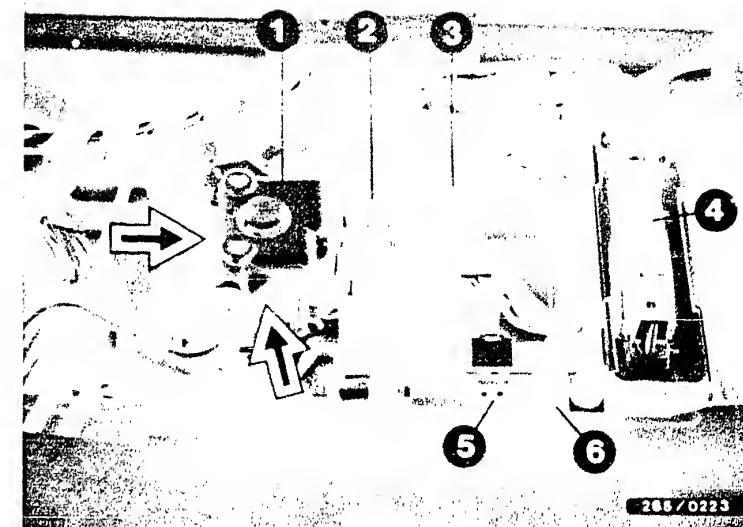
Arrow = Lug with mechanical coding

C8

Test with ABS tester
Volvo 740/760



TEST STEP 3		
Operation:		Reading:
Program selector switch position	2	Lamp 3 (green) must light up
Operation in vehicle: Switch on ignition.		yes ↓ Continue testing with next test step.
		no ↓ Lamp 4 (red) lights up
		Testing:
		Component: Valve relay
		Operation: Relay make contact
		Malfunction: Lamp 4 (red) lights up



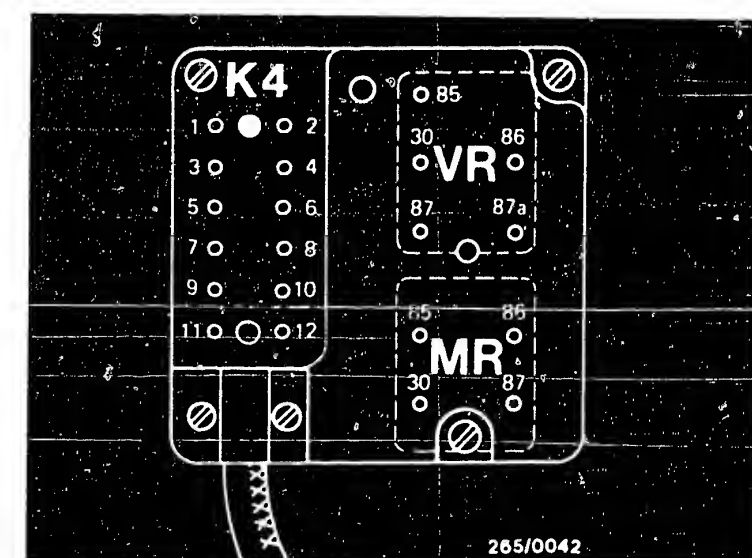
1 = Hydraulic modulator
2 = Valve relay
3 = Motor relay

Top view of plug-in plate of hydraulic modulator
VR = Valve relay
MR = Return-pump relay
K4 = Wiring harness plug

Trouble-shooting (switch off ignition)

- Fuse no. 2 defective.
- Valve relay defective.
Caution! Use only relay with correct electrical terminal assignment.
- Test the following cables for continuity:
 - From term. B+ to plug K3/term.6
 - From K4/term.6 to valve relay term.87
 - From K3/term.2 to multiple plug K1/term.27
 - From K4/term.2 to valve relay term.85
 - From valve relay term.86 to return-pump relay term.86
 - From return-pump relay term.86 to K4/term.10
 - From K3/term.10 to overvoltage protection relay term.87/3.

Continued on C 11



C9

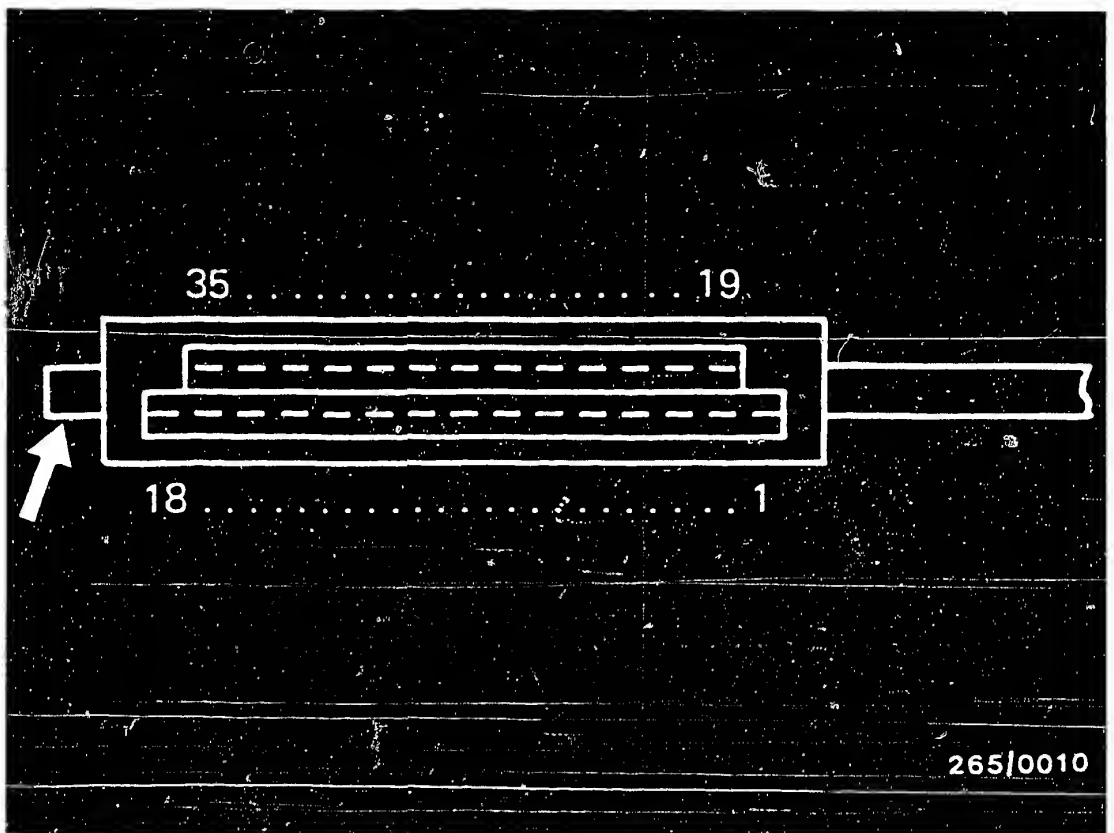
Test with ABS tester
Volvo 740/760



C10

Test with ABS tester
Volvo 740/760





265/0010

Trouble-shooting for TEST STEP 3 (continued)

Top view of multiple plug K 1 (35-pin) with terminal numbers.

Arrow = Lug with mechanical coding.

C11

Test with ABS tester

Volvo 740/760

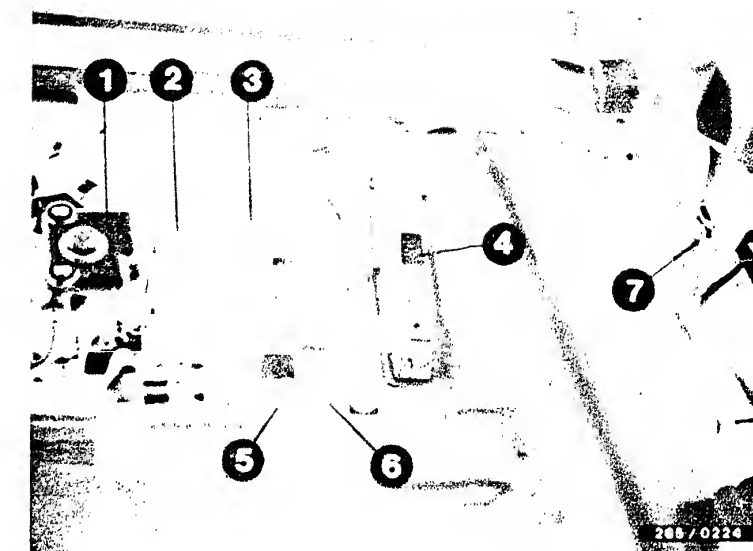


TEST STEP 4			
Operation:		Reading:	Testing:
Program-selector switch position	3	Lamp 3 (green) must light up.	Component: Return-pump relay
Operation in vehicle: Switch on ignition.		<div> <div>yes</div> <div>↓</div> <div>Continue testing with next test step.</div> </div> <div>no</div>	Operation: Off-position Malfunction: Lamp 4 (red) lights up

Trouble-shooting (switch off ignition):

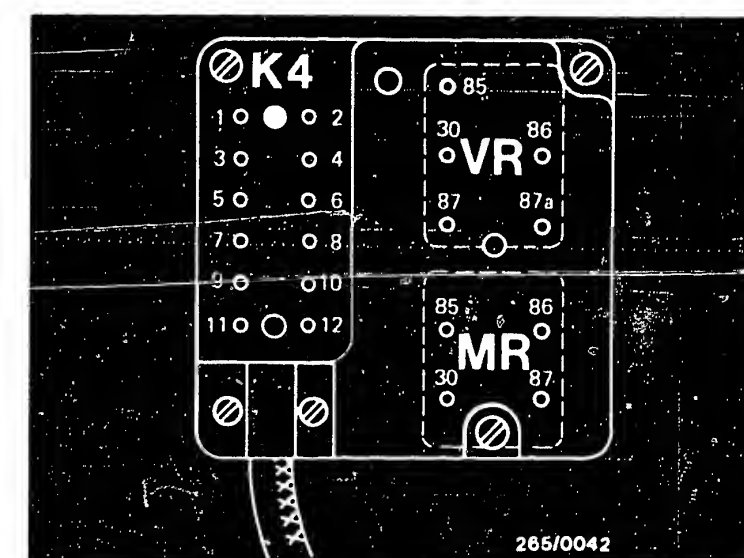
- Return-pump relay defective.
- Check ground terminals of pump motor for security and contact resistance.
- Test the following cables for continuity:
From multiple plug K1/term.14 to plug K3/term.9
From K4/term.9 to return-pump relay term.30 and to positive terminal of pump motor.
- Check positive terminal of pump motor for security. Check pump motor for continuity. If no continuity, continue testing with test step 5.

Continued on C 14



- 1=Hydraulic modulator
- 2=Valve relay
- 3=Motor relay
- 7=ABS ground terminal

Top view of plug-in plate of hydraulic modulator
 VR = Valve relay
 MR = Return-pump relay
 K4 = Wiring harness plug



C12

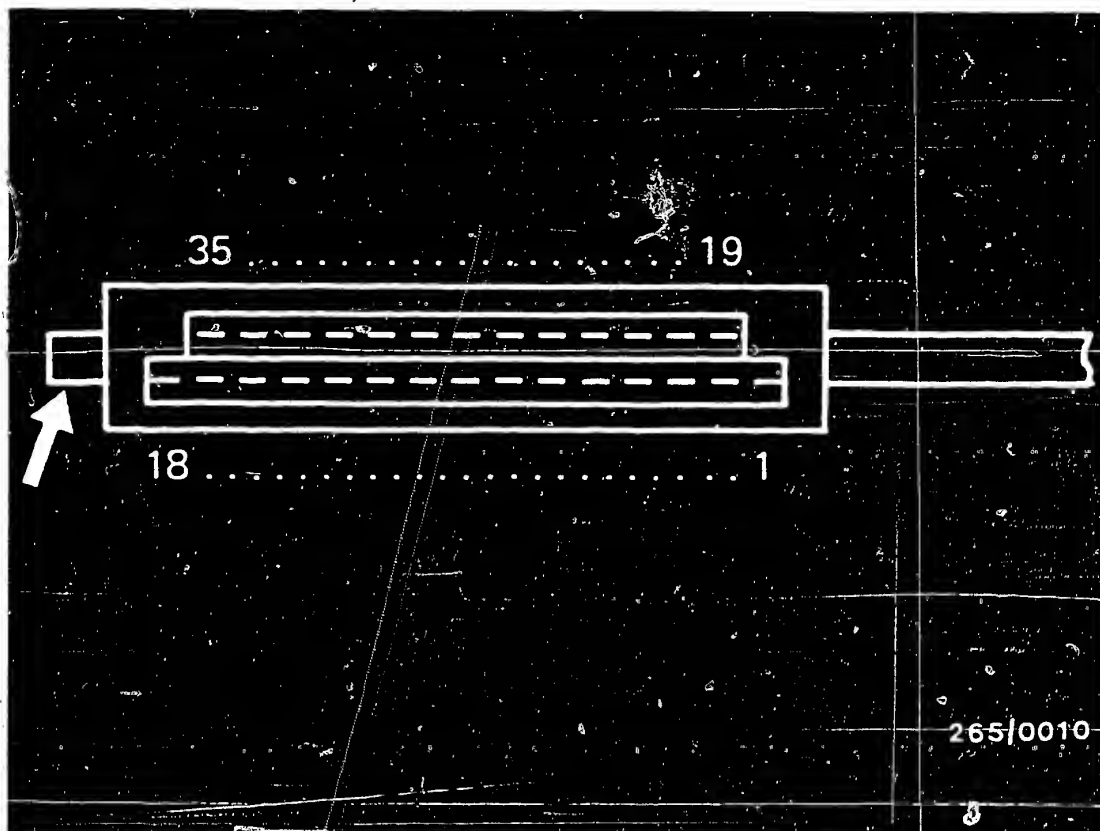
Test with ABS tester
Volvo 740/760



C13

Test with ABS tester
Volvo 740/760





Trouble-shooting for TEST STEP 4 (continued)

Top view of multiple plug K 1 (35-pin) with terminal numbers.

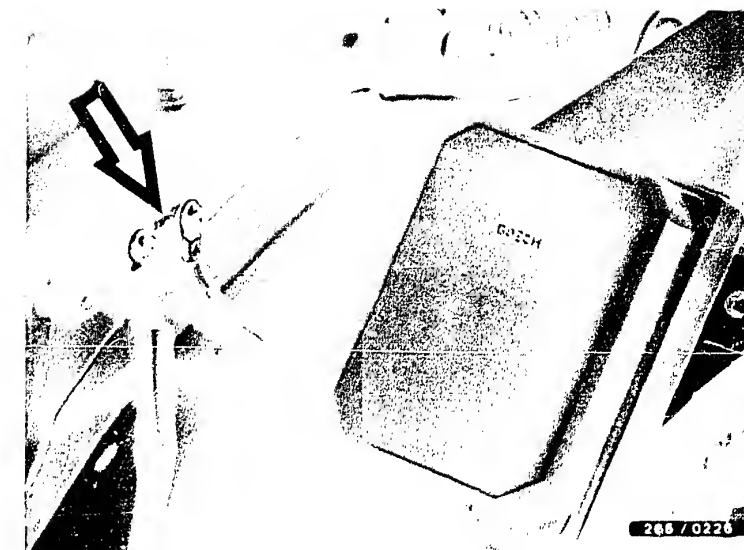
Arrow = Lug with mechanical coding

TEST STEP 5			
Operation:		Reading:	Testing:
Program-selector switch position	4	Lamp 3 (green) must light up Pump motor can be heard to operate.	Component: Return-pump relay
Illuminated key lights up press key	●	<div> <div>yes</div> <div>no</div> </div>	Operation: Relay make contact
Operation in vehicle: Switch on ignition		<div> <div>Continue test- ing with <u>next</u> test step.</div> </div>	Malfunction: Lamp 4 (red) lights up

Trouble-shooting (switch off ignition)

- Fuse (80A) in engine compartment defective.
- Return-pump relay defective.
- Test the following cables for continuity:
From multiple plug term.85 to K4/term.11
From K3/term.11 to multiple plug K1/term.28
From return-pump relay term.87 to K4/term.12
From K3/term. 12 to term. B+ through 80A fuse.
- Pump motor not operating:
Continue testing with test step 6.

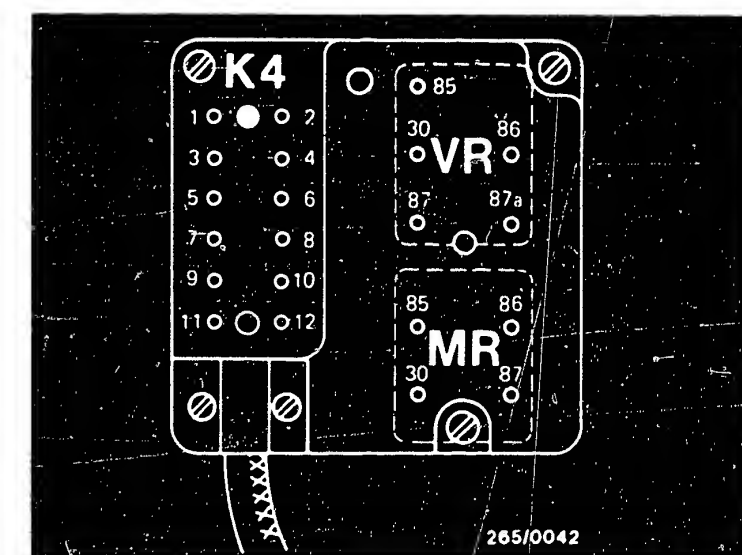
Continued on C 17



Arrow=80A fuse

Top view of plug-in plate of hydraulic modulator

VR = Valve relay
MR = Return-pump relay
K4 = Wiring harness plug



C15

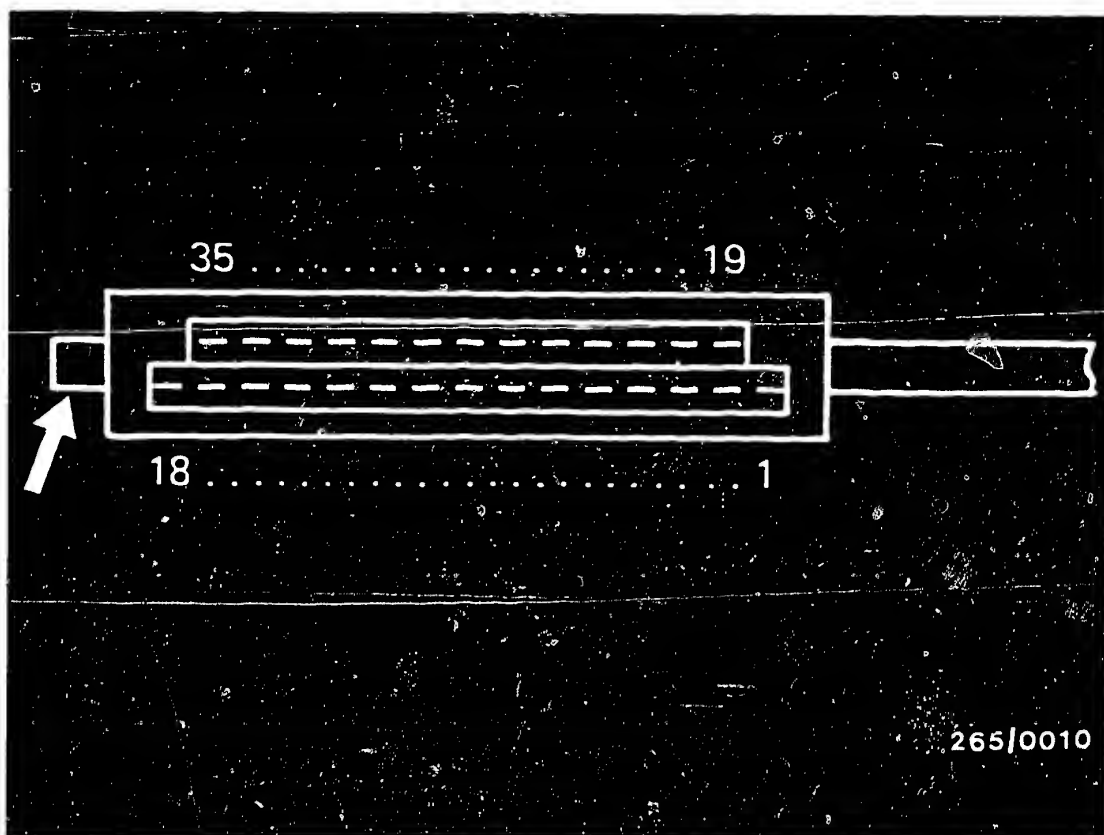
Test with ABS tester
Volvo 740/760



C16

Test with ABS tester
Volvo 740/760





265/0010

Trouble-shooting for TEST STEP 5 (continued)

Top view of multiple plug K 1 (35-pin) with terminal numbers.

Arrow = Lug with mechanical coding.

C17

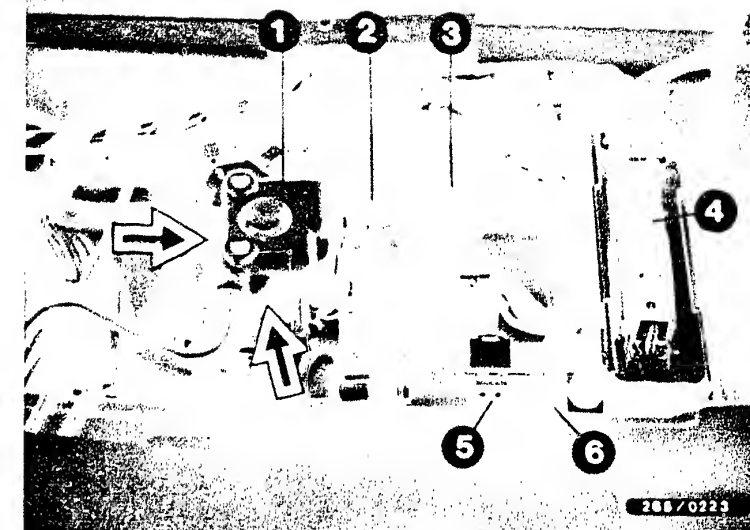
Test with ABS tester

Volvo 740/760



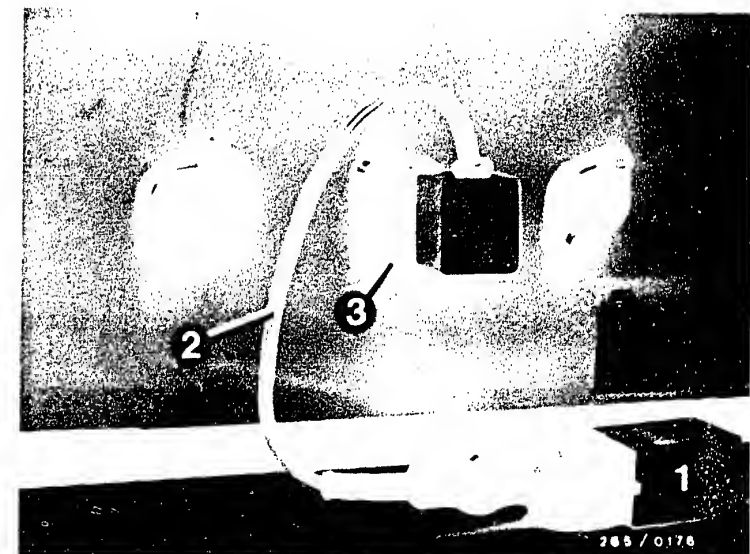
TEST STEP 6

Operation:		Reading:	Testing:
Program-selector switch position	5	Lamp 3 (green) must light up.	<u>Component:</u> Overvoltage protection relay
<u>Additional operation:</u> 1. Switch off ignition. Disconnect controller. 2. Using adapter cable, plug overvoltage protection relay from vehicle into test socket on back of tester. <u>Caution:</u> Install only overvoltage protection relays of the same type. Plug adapter cable (as shown in bottom picture) in test socket turned through 180° and offset. 3. Plug new overvoltage protection relay in vehicle and leave there. 4. Switch on ignition and wait approx. 1 s, then press illuminated key (lit). 5. Reading O.K., overvoltage protection relay in test socket O.K. 6. Re-connect controller, switching off ignition beforehand.		<div><div>yes</div><div>↓</div><div>Continue testing with <u>next test step</u>.</div></div> <div><div>no</div><div>↓</div></div>	<u>Operation:</u> Built-in fuse and unidirectional-breakdown diode are tested.
			<u>Malfunction:</u> Lamp 4 (red) lights up



5=Overvoltage-protection relay
6=Control unit for signal conversion

1 = Overvoltage protection relay
2 = Adapter cable
3 = Test socket on tester



Trouble-shooting (switch off ignition):

1. Repeat test step.
2. The overvoltage protection relay plugged into the tester is defective. Check plug-in fuse in overvoltage protection relay.

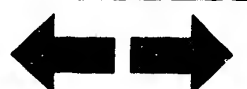
C18

Test with ABS tester
Volvo 740/760



C19

Test with ABS tester
Volvo 740/760



TEST STEP 7			
Operation:		Reading:	Testing:
Program-selector switch position	6	Read off digital display unit each time after pressing a key. <u>0.7 ... 1.7 Ω</u> <u>0.7 ... 1.7 Ω</u> <u>0.7 ... 1.7 Ω</u>	Component: Hydraulic modulator
1. Press key FL	●		Operation: Valve internal resistance FL
2. Press key FR	●		Valve internal resistance FR
3. Press key RA	●		Valve internal resistance RA
Operation in vehicle: Switch on ignition.		If reading OK, continue testing with next test step.	Malfunction: Internal resistance less than 0.7 Ω or greater than 1.7 Ω

Trouble-shooting (switch off ignition)

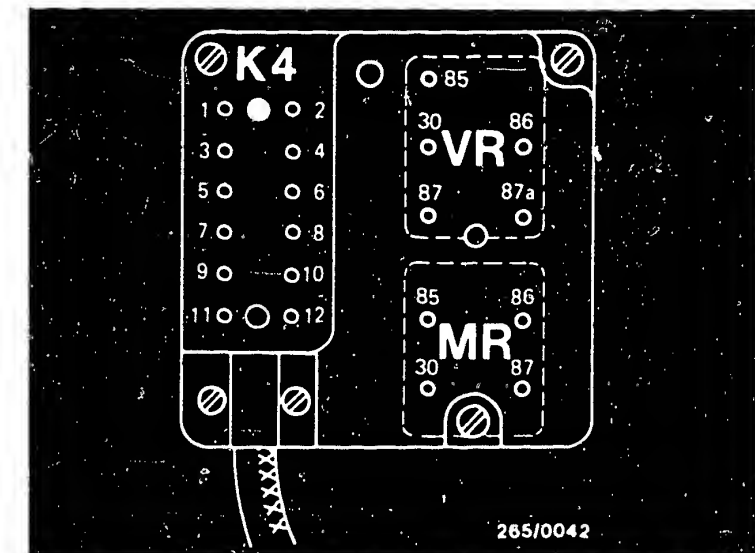
1. Measure internal resistance directly at hydraulic modulator:

Valve FL	between K4/term.1 and K4/term.4
Valve FR	between K4/term.3 and K4/term.4
Valve RA	between K4/term.5 and K4/term.4

Nominal value not reached:

Replace hydraulic modulator.

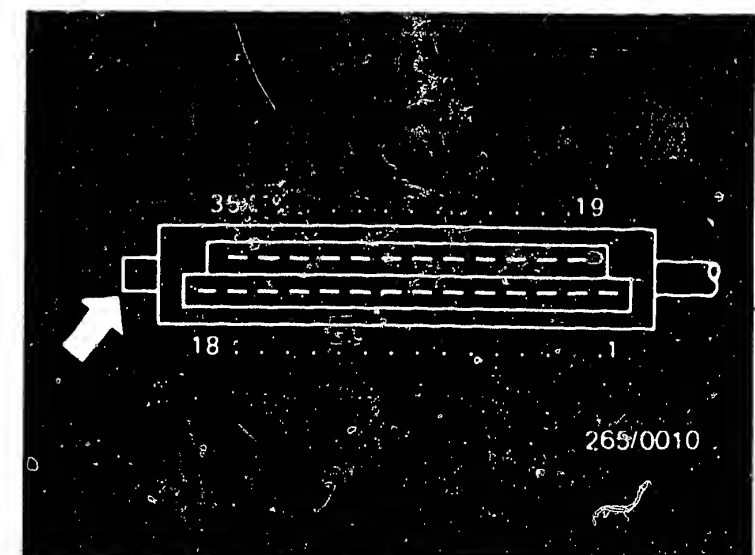
Continued on C 22/C 23



Top view of plug-in plate of hydraulic modulator

VR = Valve relay
MR = Return-pump relay
K4 = Wiring harness plug

Top view of multiple plug K1 (35-pin) with terminal numbers
Arrow = Lug with mechanical encoding



C20

Test with ABS tester
Volvo 740/760



C21

Test with ABS tester
Volvo 740/760



Trouble-shooting for TEST STEP 7 (continued)

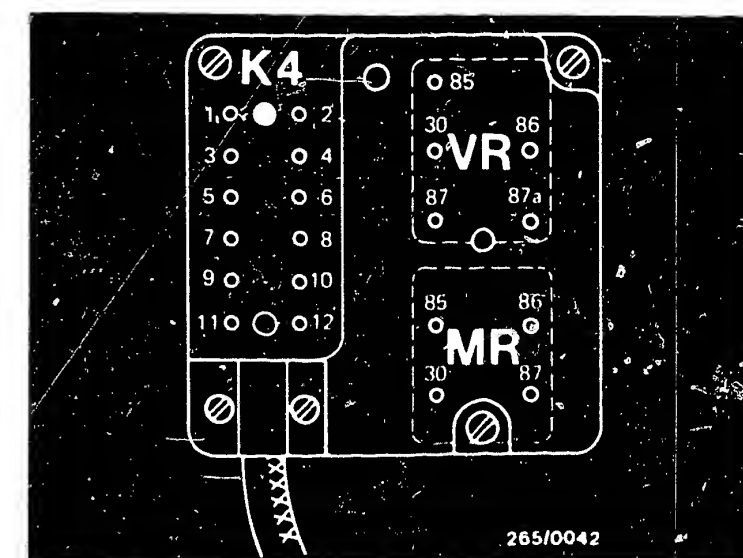
2. Test cables for continuity (set value 0 Ω)

Valve FL	between K3/term.1 and multiple plug K1/term.2
Valve FR	between K3/term.3 and multiple plug K1/term.35
Valve RA	between K3/term.5 and multiple plug K1/term.18

If open circuit:

- Check plug-in connections
- Eliminate open circuit

Continued on D 1/D 2



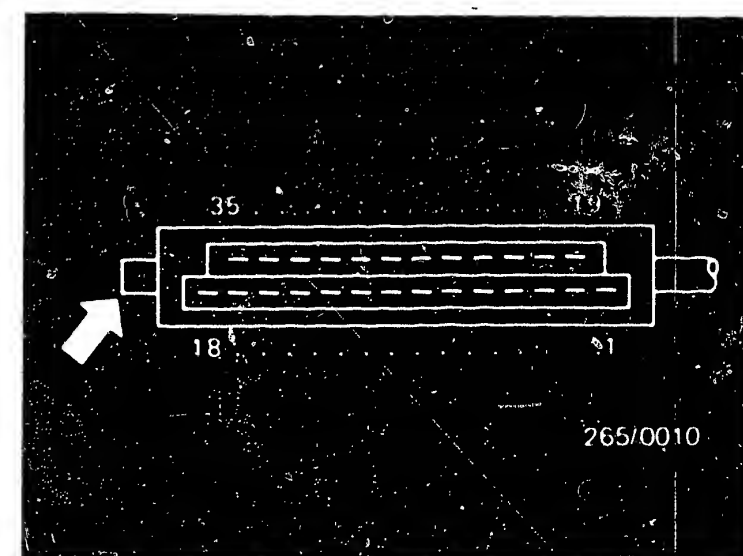
Top view of plug-in plate of hydraulic modulator

VR = Valve relay

MR = Return-pump relay

K4 = Wiring harness plug

Top view of multiple plug K1 (35-pin) with terminal numbers
Arrow = Lug with mechanical encoding



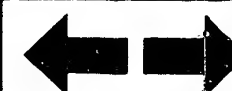
C22

Test with ABS tester
Volvo 740/760



C23

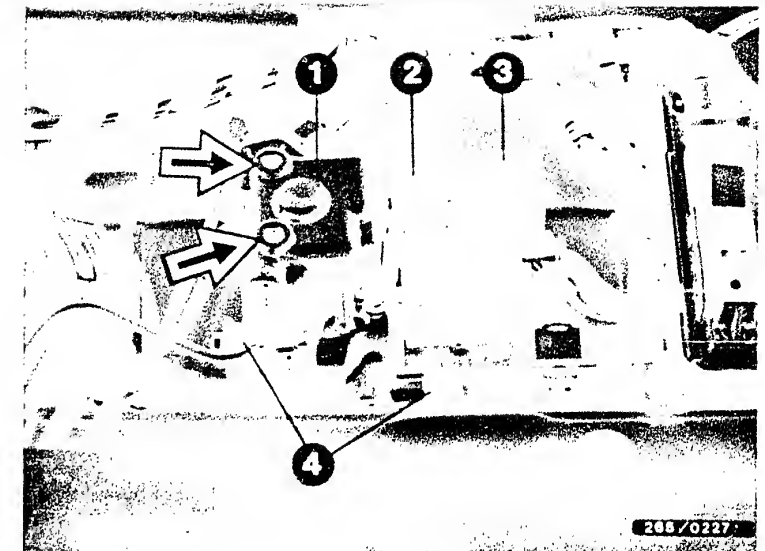
Test with ABS tester
Volvo 740/760



Trouble-shooting for TEST STEP 7 (continued)

Removing the hydraulic modulator

- For safety reasons, the hydraulic modulator must not be repaired, but the complete unit must be replaced.
Exceptions to this are the return-pump relay and the valve relay. Both relays may be replaced.
- Apart from the brake-line connections no screws on the hydraulic modulator may be loosened. The hexagon-socket-head cap screws (arrows) may under no circumstances be loosened. After loosening, the brake circuits can no longer be got free of leaks or the brake circuits can no longer be bled.
Danger!
- Check the hydraulic modulator and brake-line connections for leaks by means of a visual examination. If brake fluid is escaping, tighten the brake-line connections (12...16 Nm) or replace, or replace the hydraulic modulator.



- 1 = Hydraulic modulator
- 2 = Valve relay
- 3 = Return-pump relay
- 4 = Fastening

Continued on D 3/D 4

D1

Test with ABS tester
Volvo 740/760



D2

Test with ABS tester
Volvo 740/760



Trouble-shooting for TEST STEP 7 (continued)

Pay particular attention to the joints identified by arrows. On the base of the hydraulic modulator there is a vent hole to the pump pistons. A slight escape of brake fluid at this point is possible.

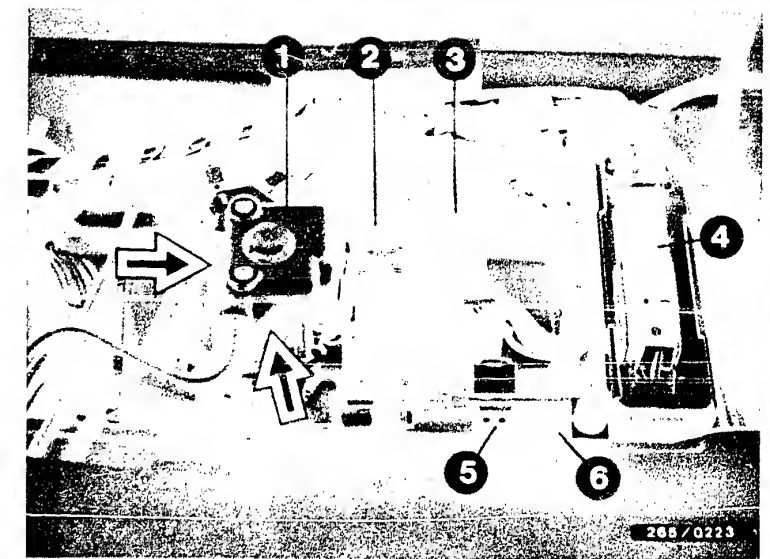
A complaint is only justified if, after pressing the brake pedal several times, a pool of brake fluid is formed under the hydraulic modulator.

- When removing and installing the brake lines, make sure that the lines are marked in accordance with the markings on the hydraulic modulator and that they are not mixed up when re-connecting (e.g. FL of hydraulic modulator must be connected to the front left wheel brake cylinder).

• Markings on hydraulic modulator:

l = Connection for brake line front left (wheel-brake cylinder)
r = Connection for brake line front right (wheel-brake cylinder)
h = Connection for brake line of rear axle

V = Front axle brake circuit from brake master cylinder
H = Rear axle brake circuit from brake master cylinder



1=Hydraulic modulator
2=Valve relay
3=Motor relay
7=ABS ground terminal

Continued on D 5/D 6

D3

Test with ABS tester
Volvo 740/760



D4

Test with ABS tester
Volvo 740/760

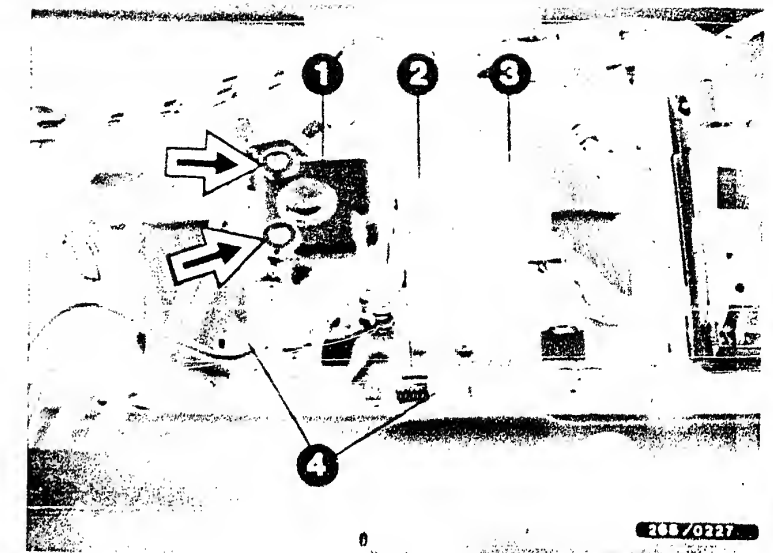


Trouble-shooting for TEST STEP 7 (continued)

- Use only the specified double-end flare nut wrench 9x11 mm for loosening and tightening the brake lines.
- Mark brake lines and remove from hydraulic modulator.
- Catch the brake fluid and do not bring it into contact with your skin or clothing or with paintwork.
- Immediately seal the brake lines and connections with dummy plugs.
- Disconnect ground cable from pump motor.
- Loosen fastening screw and remove cover.
- Loosen bracket and remove plug.
- Loosen hexagon nuts from holder and remove hydraulic modulator.

Installation

- Mount hydraulic modulator in the holder and fasten with the hexagon nuts.
- Connect ground cable to pump motor. Plug on 12-pin plug and fasten with the bracket.
- Fasten cover on the hydraulic modulator with the screw.
- Connect the brake lines to the hydraulic modulator in accordance with the markings.
- Note tightening torque for brake line connections on hydraulic modulator: 12...16 Nm.
- Bleed the brake system and check for leaks.
- Fully test the ABS with the tester.



- 1 = Hydraulic modulator
- 2 = Valve relay
- 3 = Return-pump relay
- 4 = Fastening

D5

Test with ABS tester

Volvo 740/760



D6

Test with ABS tester

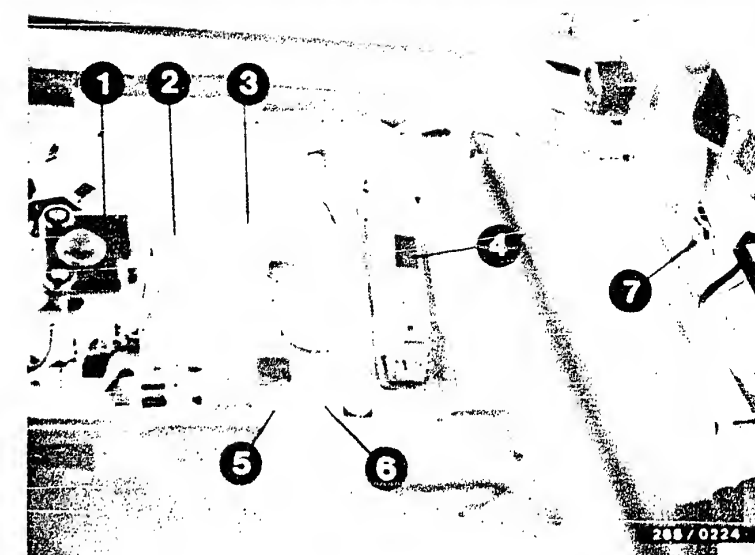
Volvo 740/760



TEST STEP 8		
Operation:		Reading:
Program-selector switch position	7	Digital display unit must indicate 80...300 mV
Illuminated key lights up, press key	●	<div> <div>yes</div> <div>no</div> </div>
Operation in vehicle: Switch on ignition		Continue testing with next test step. Malfunction: Reading less than 80 mV or greater than 300 mV

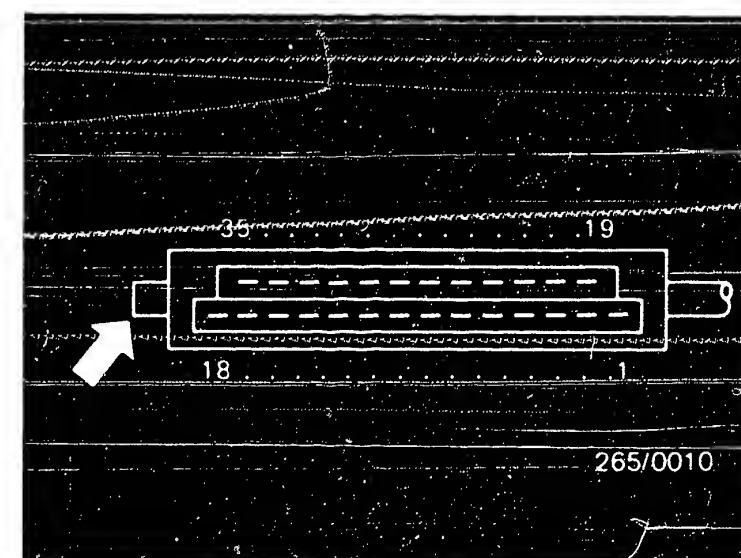
Trouble-shooting: (switch off ignition):

1. Reading less than 80 mV: Have the tester checked.
2. Reading greater than 300 mV: Check ground terminal (on tail lamp) for high contact resistance and open circuit.
Test ground lead to multiple plug K1/term. 10 for open circuit.



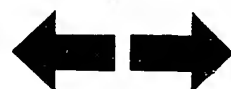
4=Control unit
7=ABS ground terminal

Top view of multiple plug K1 (35-pin) with terminal numbers
Arrow = Lug with mechanical plug



D7

Test with ABS tester
Volvo 740/760



D8

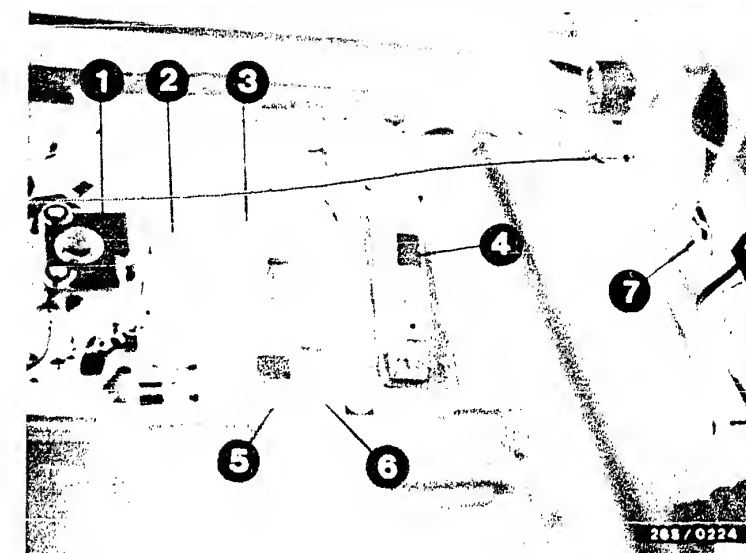
Test with ABS tester
Volvo 740/760



TEST STEP 9			
Operation:		Reading:	Testing:
Program-selector switch position	8	Digital display unit must indicate 10...250 mV	Component: Ground connection term.34
Illuminated key lights up, press key	●	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> yes ↓ </div> <div style="text-align: center;"> no ↓ </div> </div>	Operation: Contact resistance
Operation in vehicle: Switch on ignition		Continue testing with next test step.	Malfunction: Reading less than 10 mV or greater than 250 mV

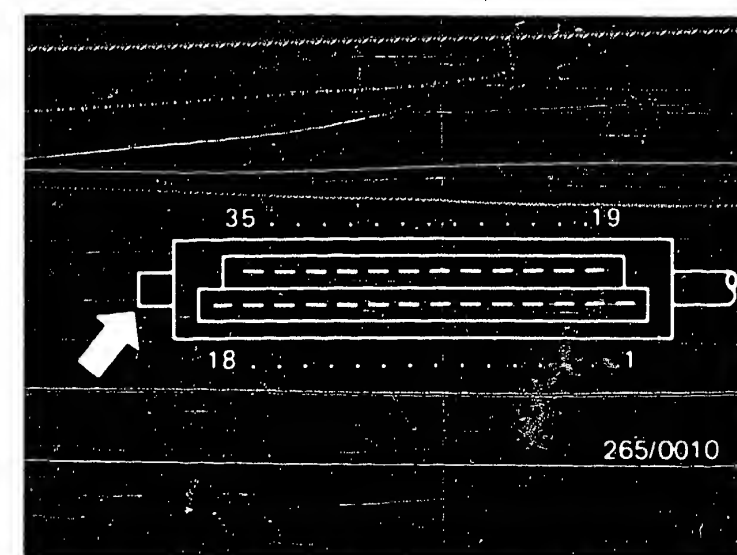
Trouble-shooting (switch off ignition):

1. Reading less than 10 mV: Have the tester checked.
2. Reading greater than 250 mV: Check ground terminal (on tail lamp) for high contact resistance and open circuit.
Test lead for open circuit:
From ground to multiple plug K1/term. 34.



4 = Control unit
7 = ABS ground terminal

Top view of multiple plug K1 (35-pin) with terminal numbers
Arrow = Lug with mechanical plug



D9

Test with ABS tester
Volvo 740/760

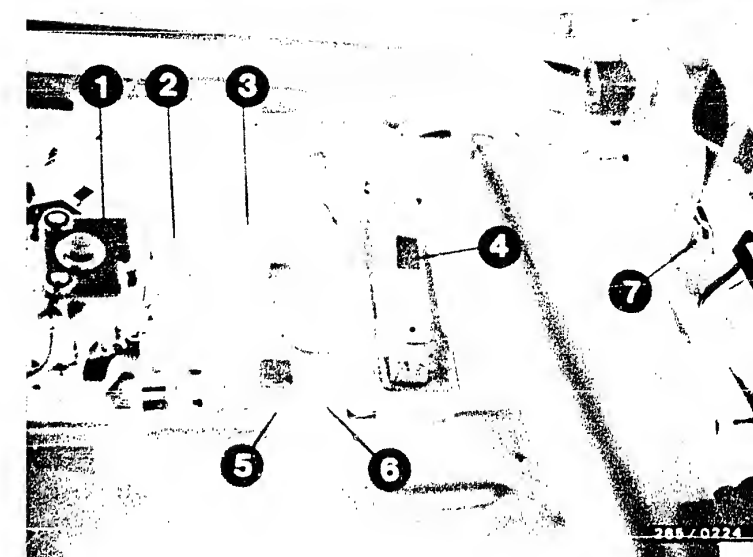


D10

Test with ABS tester
Volvo 740/760



TEST STEP 10			
Operation:		Reading:	Testing:
Program-selector switch position	9	Digital display unit must indicate <u>10...250 mV</u>	Component: Ground connection term. 20
Illuminated key lights up, press key	●	<div style="display: flex; align-items: center; justify-content: center;"> <div style="text-align: center;"> yes ↓ </div> <div style="margin: 0 10px;">↓</div> <div style="text-align: center;"> no ↓ </div> </div>	Operation: Contact resistance
Operation in vehicle: Switch on ignition		Continue testing with <u>next test step.</u>	Malfunction: Reading less than 10 mV or greater than 250 mV

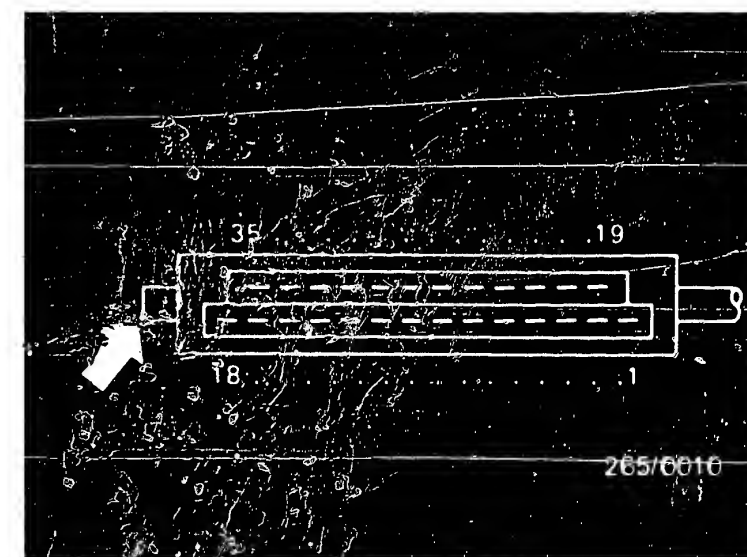


4 = Control unit
7 = ABS ground terminal

Top view of multiple plug K1 (35-pin) with terminal numbers
Arrow = Lug with mechanical plug

Trouble-shooting (switch off ignition):

1. Reading less than 10 mV: Have the tester checked.
2. Reading greater than 250 mV: Check ground terminal (on tail lamp) for high contact resistance and open circuit.
Test lead for open circuit:
From ground to multiple plug K1/term. 20



D11

Test with ABS tester
Volvo 740/760



D12

Test with ABS tester
Volvo 740/760



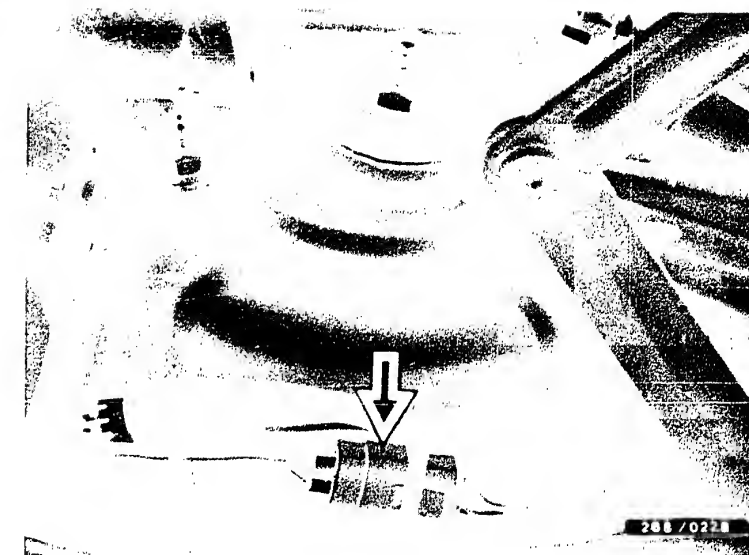
TEST STEP 11		Reading:	Testing:
<u>Operation:</u>			
Program-selector switch position	10	Digital display unit: for FL and FR: $0,6 \dots 1,6 \text{ k}\Omega$ ¹⁾	<u>Component:</u> Wheel-speed sensors front left and front right.
Press keys FL and FR one after the other	●	yes ↓ no	<u>Operation:</u> Internal resistance
<u>Operation in vehicle:</u> Switch on ignition		Continue test- ing with next test step.	<u>Malfunction:</u> Reading less than $0,6 \text{ k}\Omega$ or greater than $1,6 \text{ k}\Omega$

Note: ¹⁾

If a vehicle is brought in with the complaint "warning lamp lighting up occasionally, but after starting again warning lamp stays off" the cause may be a loose contact in the wheel-speed sensor cables or in the coaxial plug-in connectors of the wheel-speed sensors. The cause will be a temporary open circuit or contacting of wires which is caused by vibrations or changes in load.

Locate the fault using the following method.

Continued on D15/D16



Arrow = Wheel-speed sensor plug connector

1=Wheel-speed sensor
2=Fastening points



D13

Test with ABS tester
Volvo 740/760



D14

Test with ABS tester
Volvo 740/760



Note on TEST STEP 11 (continued)

Method of testing for loose contacts with wheel-speed sensors:

- One after the other, select wheel-speed sensors by pressing key.
- On the wheel-speed sensor which has been selected, move the corresponding cable directly at the wheel-speed sensor and at the fastening points and also move the coaxial plug connector, also bend and pull.
- At the same time watch the digital display on the tester:
If there is a sharp change in the digital reading, there is a loose contact. In the case of an open circuit the reading becomes greater (max. 999), in the case of a short circuit (usually at the wiring-harness plug) the reading becomes smaller (min. 000).
- Replace wheel-speed sensor.
- Replace wiring harness.

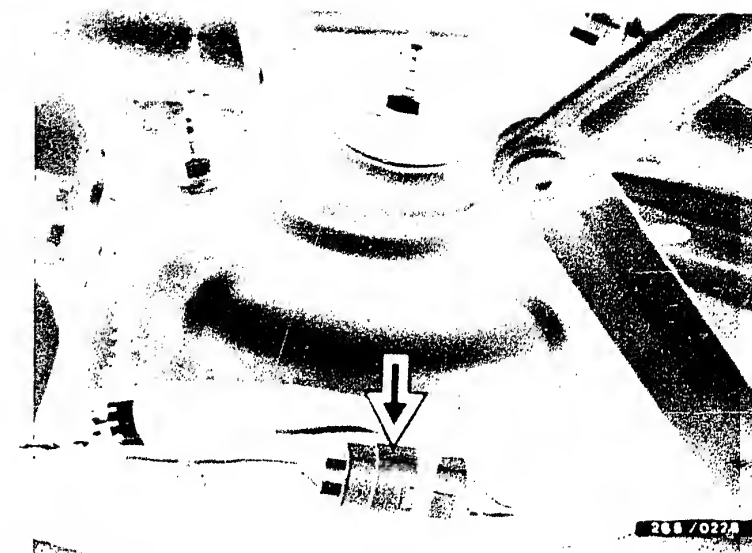
^ Trouble-shooting (switch off ignition)

1. Measure internal resistance at disconnected connectors.
If the set value is not reached: Replace the corresponding wheel-speed sensor.
2. Test the following leads for continuity.
From plug K 11 to multiple plug K1/term. 6 and term. 4.
From plug K 13 to multiple plug K1/term. 23 and term. 21.
3. Check plug connections for corrosion and good contacting.

Remove wheel-speed sensor on front axle.

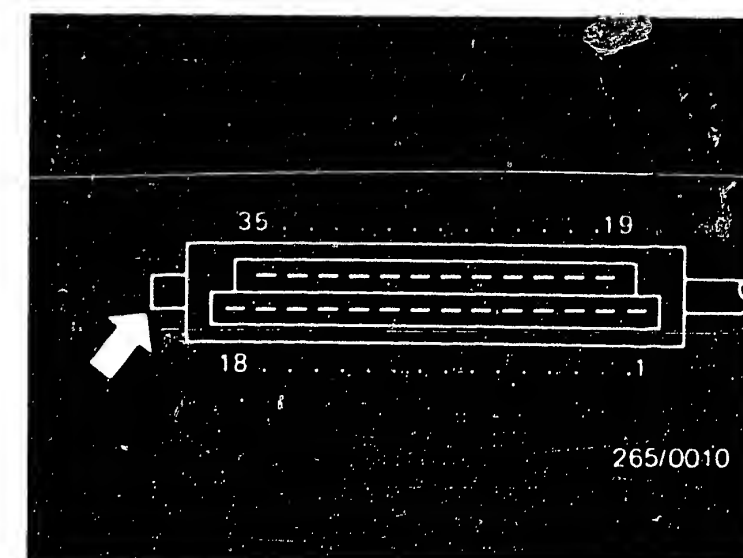
- Plug connectors are in engine compartment on right/left on spring-strut crowns.
- Take apart plug connector.
- Loosen fastening screw for wheel-speed sensor and carefully remove wheel-speed sensor. Do not use force.
- Loosen mountings of wheel-speed sensor cable and pull cable through rubber grommet in wheel house.

Continued on D 17/D 18



Arrow = Wheel-speed sensor
plug connector

Top view of multiple plug K1
(35-pin) with terminal
numbers.
Arrow = Lug with mechanical
encoding



D15

Test with ABS tester

Volvo 740/760



D16

Test with ABS tester

Volvo 740/760



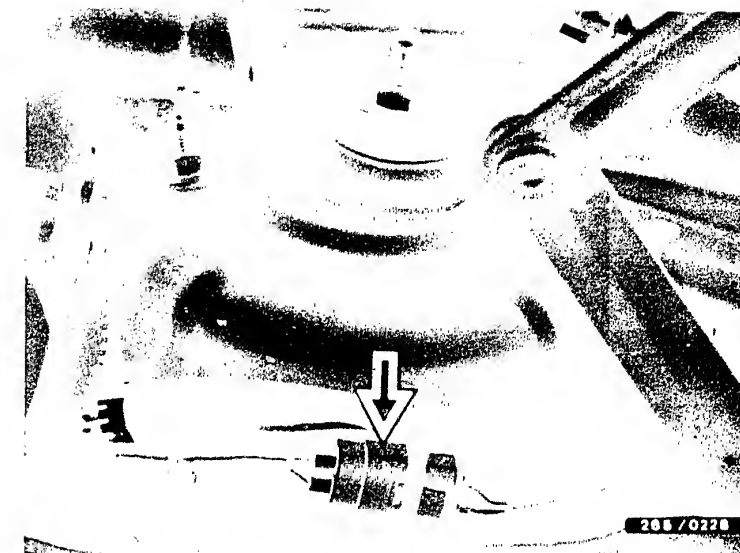
Trouble-shooting - TEST STEP 11 (continued)

Install wheel-speed sensor on front axle.

- Check O-ring for cracks and replace if necessary.
- Only take new wheel-speed sensor out of protective sleeve when ready for mounting.
- Grease wheel-speed sensor housing lightly with Molykote Longterm 2.
- Make sure that no metallic foreign bodies are on the permanently magnetic edge.
- Carefully press wheel-speed sensor into mounting hole as far as it will go. Do not knock.
- Use new micro-encapsulated fastening screws. Tighten fastening screws to 6...8 Nm.
- Pull lead into engine compartment and re-fasten at the points provided.

Note: The fastening places for the wheel-speed sensor cable are provided with red colour marks.

- Connect wheel-speed sensor to ABS wiring harness and fasten plug connector.
- After repairing, perform test with ABS tester.



Arrow = Wheel-speed sensor
plug connector

1 = Wheel-speed sensor
2 = Fastening points



D17

Test with ABS tester

Volvo 740/760



D18

Test with ABS tester

Volvo 740/760



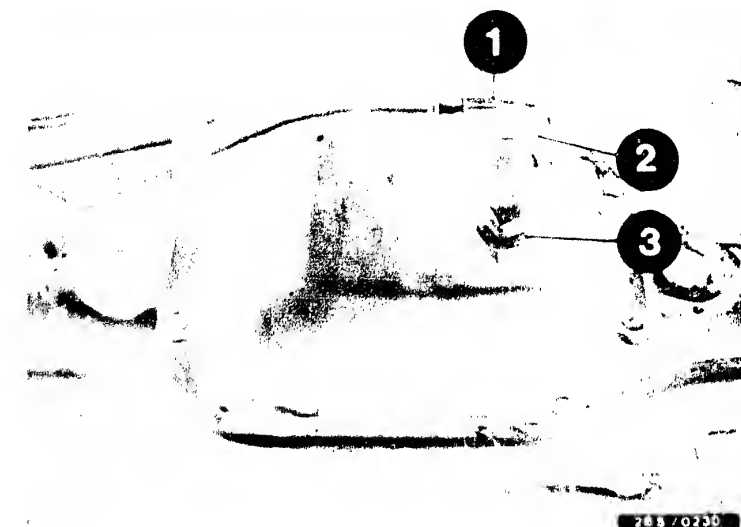
TEST STEP 12		Reading:	Testing:
Operation:			
Program-selector switch position	10	Digital display unit must indicate $0,6 \dots 1,6 \text{ k}\Omega$ ¹⁾	Component: Wheel-speed sensor for rear axle
Press key RA.	●	yes ↓	Operation: Internal resistance
Operation in vehicle: Switch on ignition		no ↓ Continue testing with next test step.	Malfunction: Reading less than $0,6 \text{ k}\Omega$ or greater than $1,6 \text{ k}\Omega$

1)Note:

If a vehicle is brought in with the complaint "warning lamp lighting up occasionally, but after starting again warning lamp stays off" the cause may be a loose contact in the wheel-speed sensor cables or in the coaxial plug-in connectors of the wheel-speed sensors. The cause will be a temporary open circuit or contacting of wires which is caused by vibrations or changes in load.

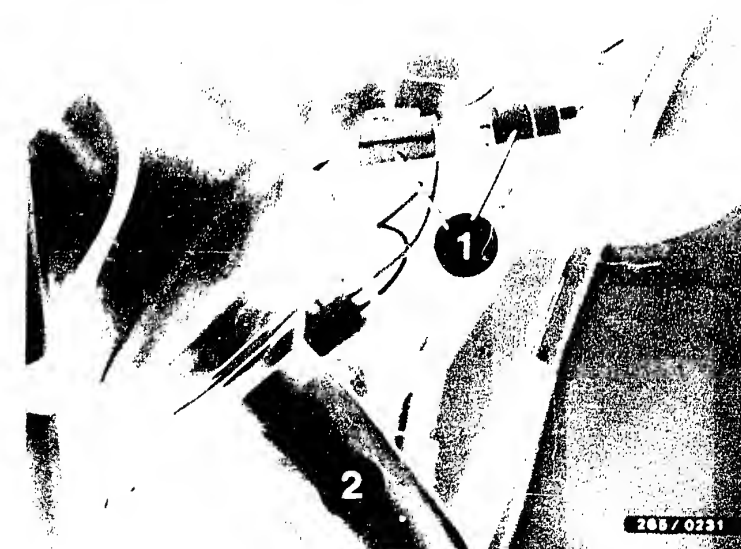
Locate the fault using the following method.

Continued on D 21/D 22



- 1=Wheel-speed sensor in rear-axle housing
- 2=Shim
- 3=Oil-drain plug

- 1=Wheel-speed sensor plug connector in luggage compartment
- 2=Tank filler neck



D 19

Test with ABS tester
Volvo 740/760



D 20

Test with ABS tester
Volvo 740/760



Note - TEST STEP 12 (continued)

Method of testing for loose contacts with wheel-speed sensor:

- Select wheel-speed sensor by pressing key.
- On the wheel-speed sensor which has been selected, move the corresponding cable directly at the wheel-speed sensor and at the mounting points and also move the plug connector, also bend and pull.
- At the same time watch the digital display on the tester:
If there is a sharp change in the digital reading, there is a loose contact. In the case of an open circuit the reading becomes greater (max. 999), in the case of a short circuit (usually at the wiring-harness plug) the reading becomes smaller (min. 000).
- Replace wheel-speed sensor.
- Replace wiring harness.

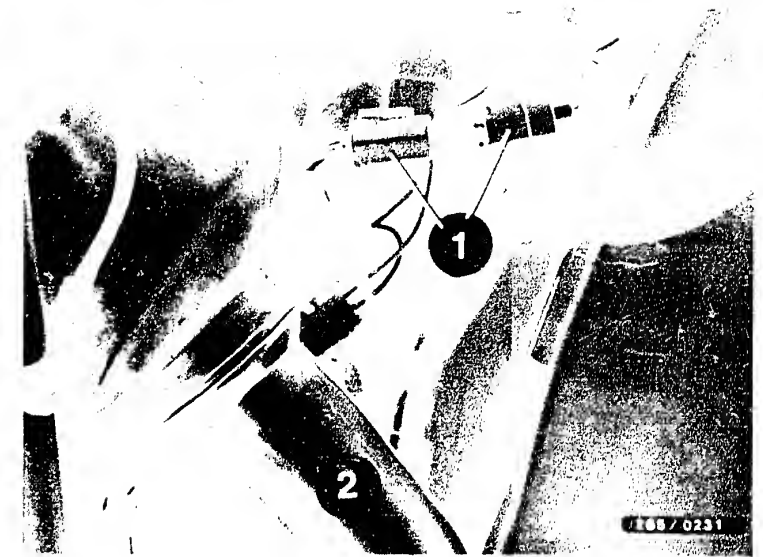
Trouble-shooting (switch off ignition)

1. Measure internal resistance at disconnected connector.
If set value reached: Replace wheel-speed sensor.
2. Test the following leads for continuity:
From plug term. 15 to multiple plug K1/term. 7 and term. 9
3. Check plug-in connector.

Remove wheel-speed sensor on rear axle

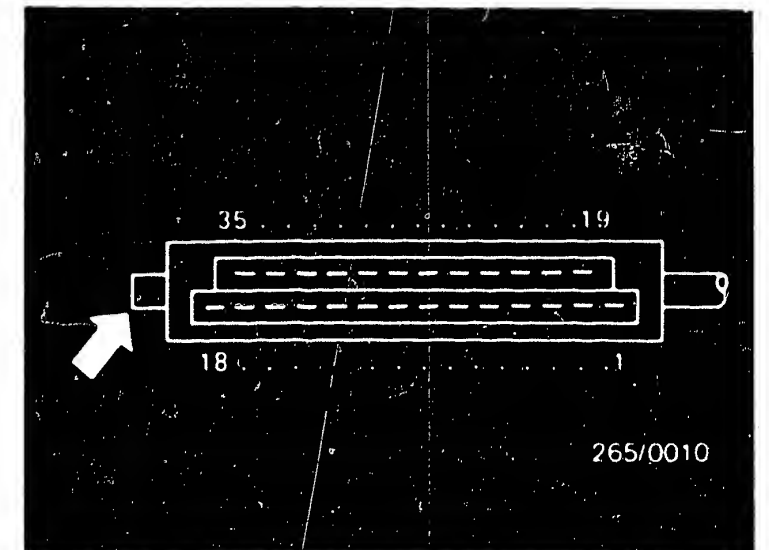
- Take apart plug connector in luggage compartment:
- Loosen fastenings of lead and pull wheel-speed sensor lead downward through bottom of luggage compartment.
- Loosen fastening screw and pull out wheel-speed sensor.
Do not use force. Do not lose shim, use for re-installation.

Continued on D23/D24



- 1 = Wheel-speed sensor plug connector
2 = Tank filler neck

Top view of multiple plug K1 (35-pin) with terminal numbers.
Arrow = Lug with mechanical encoding



D21

Test with ABS tester
Volvo 740/760



D22

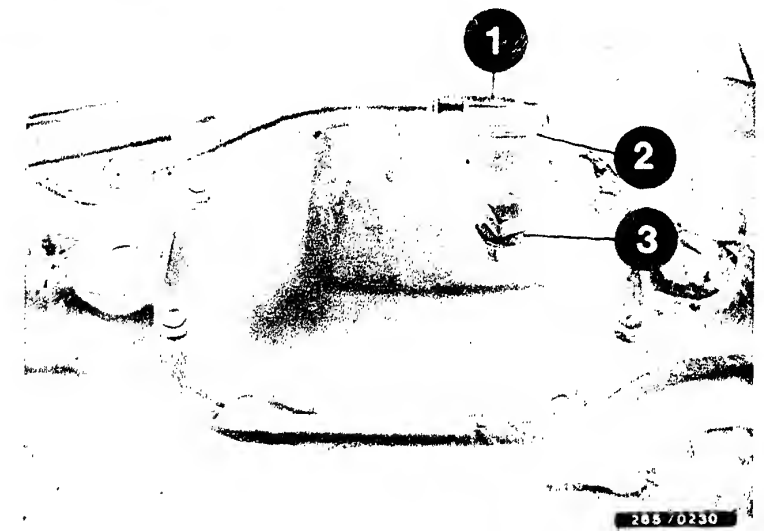
Test with ABS tester
Volvo 740/760



Trouble-shooting - TEST STEP 12 (continued)

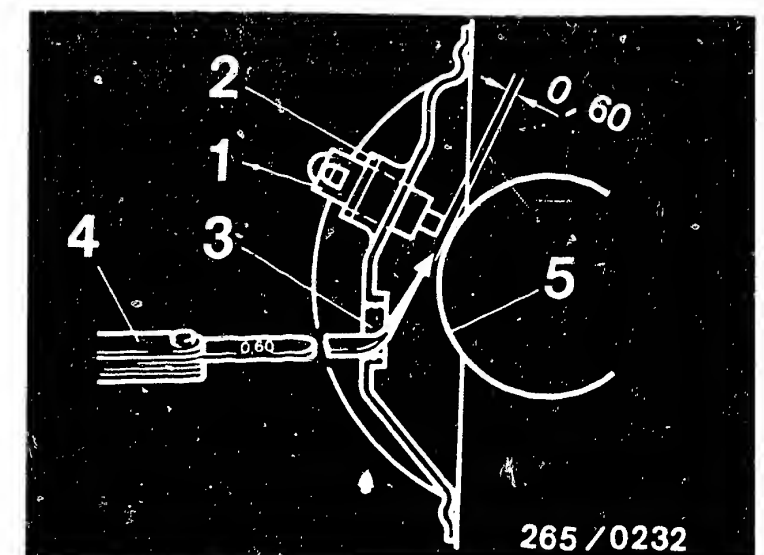
Install wheel-speed sensor on rear axle

- Check O-ring for cracks and replace if necessary.
- Only take new wheel-speed sensor out of protective sleeve when ready for mounting.
- Grease wheel-speed sensor housing lightly with Molykote Longterm 2. Mount shim(s).
- Make sure that no metallic foreign bodies are on the permanently magnetic edge.
- Carefully press wheel-speed sensor into mounting hole as far as it will go. Do not knock.
- Measure air gap between wheel-speed sensor edge and ring gear with feeler gauge. Should be: 0.35 ... 0.75 mm. If necessary, adjust air gap to nominal dimension 0.6 mm with shim. To measure the air gap, remove the oil-drain plug and introduce feeler gauge as shown. Turn drive bevel gear slightly. Shims are obtainable from Volvo agents in thicknesses between 1.0 and 1.8 mm in stages of 0.2 mm.
- Use new micro-encapsulated fastening screw. Tighten fastening screws to 6 ... 8 Nm.
- Re-fasten lead at points provided.
- Connect wheel-speed sensor to ABS wiring harness.
- After repairing, perform test with ABS tester.



1=Wheel-speed sensor in rear-axle housing
2=Shim
3=Oil-drain plug

1=Wheel-speed sensor
2=Shim
3=Oil-drain plug
4=Feeler gauge
5=Drive bevel gear



D23

Test with ABS tester
Volvo 740/760

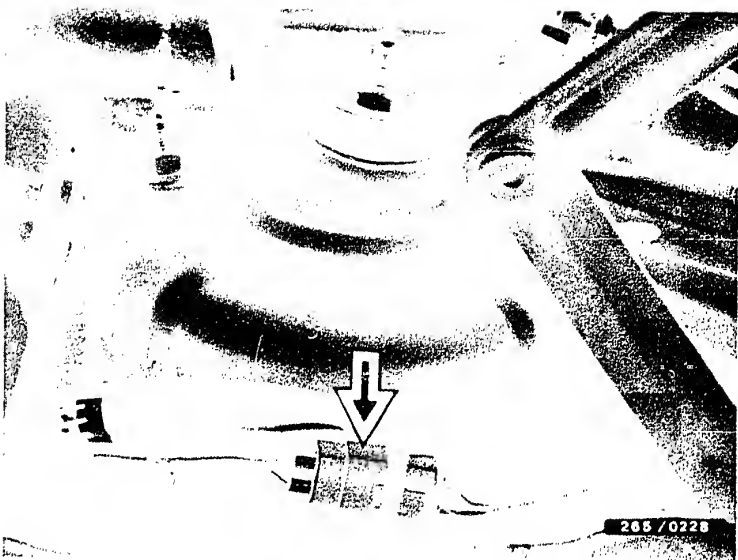


D24

Test with ABS tester
Volvo 740/760

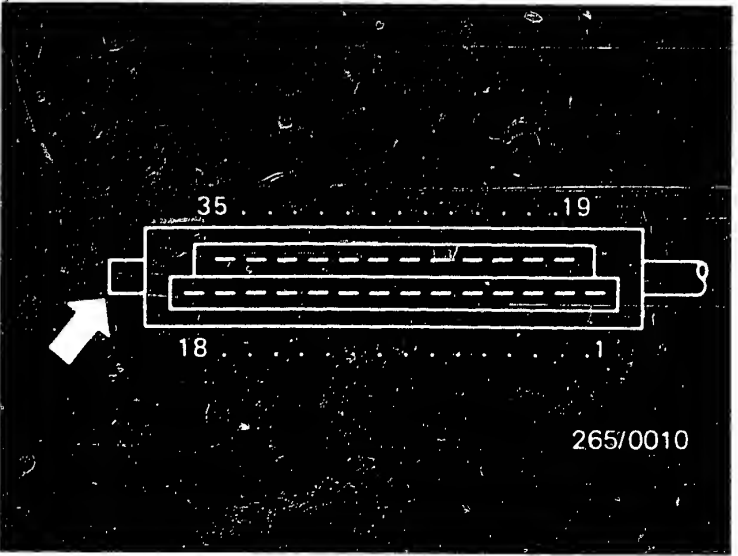


TEST STEP 13			
Operation:		Reading:	Testing:
Program-selector switch position	11	Digital display unit: for FL and FR: 20 ... 999 k Ω	Component: Wheel-speed sensors front left and front right
Press keys FL and FR one after the other	●	<div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> yes ↓ Continue test- ing with <u>next</u> test step. </div> <div style="text-align: center;"> no ↓ </div> </div>	Operation: Insulation resistance Malfunction: Reading less than 20 k Ω
Operation in vehicle: Switch on ignition			



Arrow = Wheel-speed sensor plug connector

Top view of multiple plug K1 (35-pin) with terminal numbers
Arrow = Lug with mechanical plug



Trouble-shooting (switch off ignition):

Plug connectors OK?
Undo plug connectors and bridge the plug leading to the tester using wire.
Repeat test:
If reading now OK, replace wheel-speed sensor.
If reading still below the nominal value, the cables from multiple plug term.6 and term.4 or term.23 and term.21 to the respective plug are defective.
Check all cables for wear and short circuit to ground.

Continued on E 3/E 4

Trouble-shooting - TEST STEP 13 (continued)

Remove wheel-speed sensors on front axle

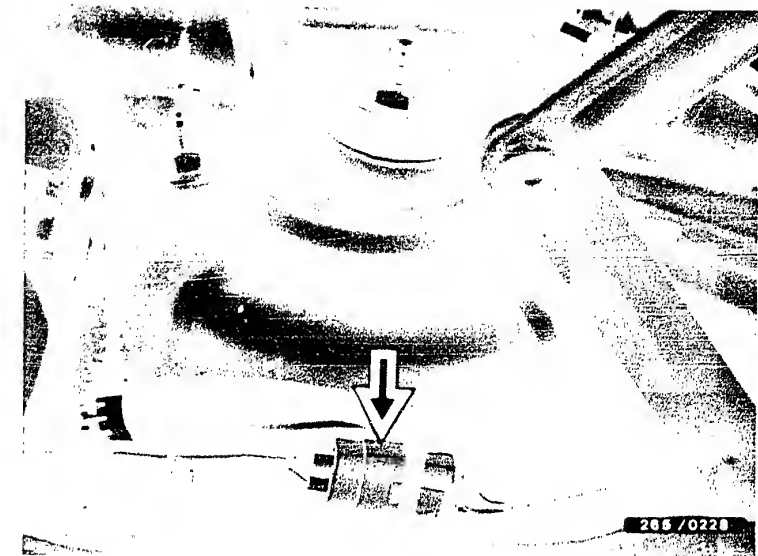
- Plug connectors are in engine compartment on right/left on spring-strut crowns.
- Take apart plug connector.
- Loosen fastening screw for wheel-speed sensor and carefully remove wheel-speed sensor.
Do not use force.
- Loosen mountings of wheel-speed sensor cable and pull cable through rubber grommet in wheel house.

Install wheel-speed sensor on front axle.

- Check O-ring for cracks and replace if necessary.
- Only take new wheel-speed sensor out of protective sleeve when ready for mounting.
- Grease wheel-speed sensor housing lightly with Molykote Longterm 2.
- Make sure that no metallic foreign bodies are on the permanently magnetic edge.
- Carefully press wheel-speed sensor into mounting hole as far as it will go. Do not knock.
- Use new micro-encapsulaped fastening screws.
Tighten fastening screws to 6...8 Nm.
- Pull lead into engine compartment and re-fasten at the points provided.

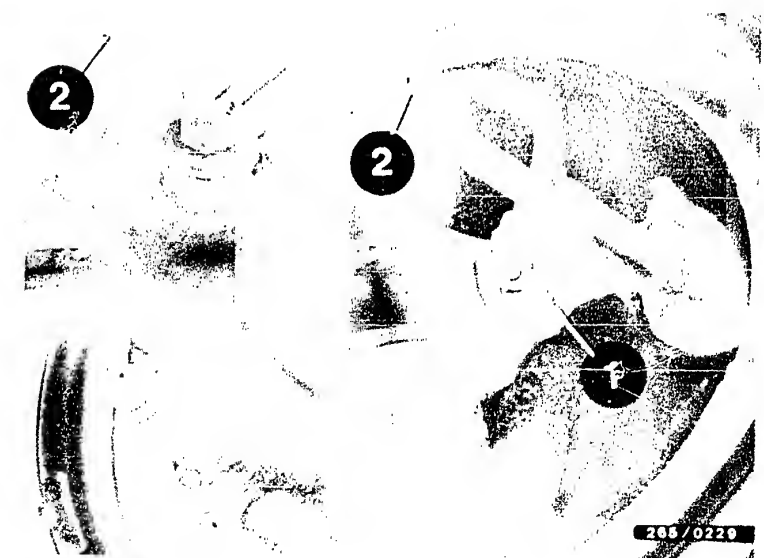
Note: The fastening points of the wheel-speed sensors are provided with color markings.

- Connect wheel-speed sensor to ABS wiring harness and fasten plug connector.
- After repairing, perform test with ABS tester.



Arrow = Wheel-speed sensor
plug connector

1 = Wheel-speed sensor
2 = Mounting points



E3

Test with ABS tester
Volvo 740/760



E4

Test with ABS tester
Volvo 740/760



TEST STEP 14		Reading:	Testing:
Operation:			
Program-selector switch position	11	Digital display unit: for RL and RR: 20 ... 999 k Ω	Component: Wheel-speed sensor for rear axle
Press key RA.	●	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 5px; text-align: center;"> yes ↓ </div> <div style="margin: 0 10px;">no</div> <div style="border-left: 1px solid black; height: 100px; position: relative;"> <div style="position: absolute; top: 0; right: 0; width: 10px; height: 100px; border-left: 1px solid black;"></div> </div> </div>	Operation: Insulation resistance
Operation in vehicle: Switch on ignition		Continue testing with <u>next test step.</u>	Malfunction: Reading less than 20 k Ω

Trouble-shooting (switch off ignition)

Plug-in connection O.K.?

Undo plug connector and bridge the connector leading to the tester with a lead.

Repeat test: If reading is now O.K., replace wheel-speed sensor. If reading is still under the set value, the leads from multiple plug term. 7 and term. 9 to the plug are defective.

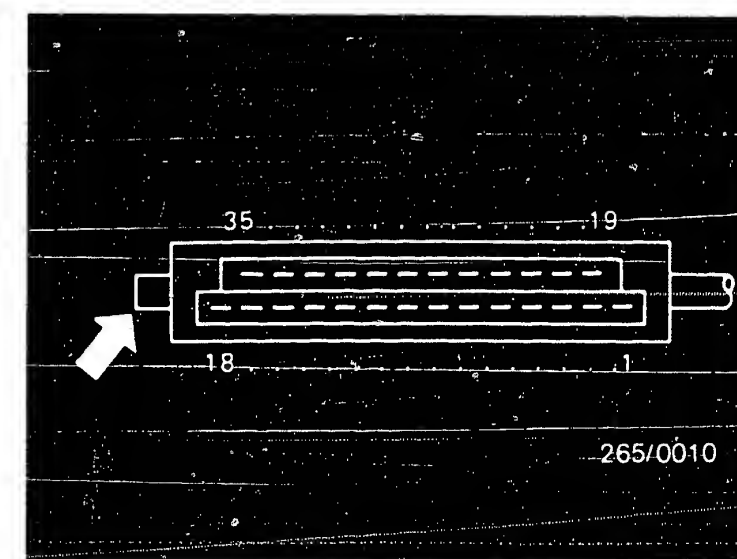
Check all cables for wear and short circuit to ground.

Continued on E 7/E 8



- 1 = Wheel-speed sensor plug connector
- 2 = Tank filler neck

Top view of multiple plug K1 (35-pin) with terminal numbers
Arrow = Lug with mechanical plug



E5

Test with ABS tester
Volvo 740/760



E6

Test with ABS tester
Volvo 740/760



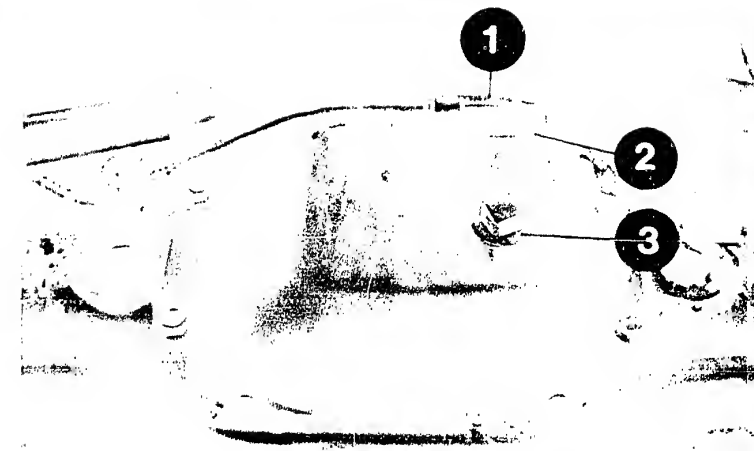
Trouble-shooting - TEST STEP 14 (continued)

Remove wheel-speed sensor on rear axle

- Take apart plug connector in luggage compartment:
- Loosen fastenings of lead and pull wheel-speed sensor lead downward through bottom of luggage compartment.
- Loosen fastening screw and pull out wheel-speed sensor.
Do not use force. Do not lose shim, use for re-installation.

Install wheel-speed sensor on rear axle

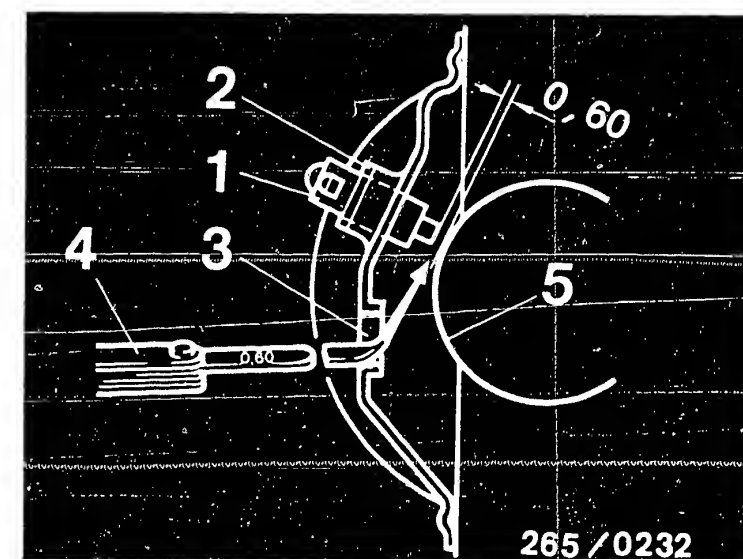
- Check O-ring for cracks and replace if necessary.
- Only take new wheel-speed sensor out of protective sleeve when ready for mounting.
- Grease wheel-speed sensor housing lightly with Molykote Longterm 2. Mount shim(s).
- Make sure that no metallic foreign bodies are on the permanently magnetic edge.
- Carefully press wheel-speed sensor into mounting hole as far as it will go. Do not knock.
- Measure air gap between wheel-speed sensor edge and ring gear with feeler gauge. Should be: 0.35 ... 0.75 mm. If necessary, adjust air gap to nominal dimension 0.6 mm with shim. To measure the air gap, remove the oil-drain plug and introduce feeler gauge as shown. Turn drive bevel gear slightly. Shims are obtainable from Volvo agents in thicknesses between 1.0 and 1.8 mm in stages of 0.2 mm.
- Use new micro-encapsulated fastening screw.
Tighten fastening screws to 6 ... 8 Nm.
- Re-fasten lead at points provided.
- Connect wheel-speed sensor to ABS wiring harness.
- After repairing, perform test with ABS tester.



265 / 0230

1=Wheel-speed sensor in rear-axle housing
2=Shim
3=Oil-drain plug

1=Wheel-speed sensor
2=Shim
3=Oil-drain plug
4=Feeler gauge
5=Drive bevel gear

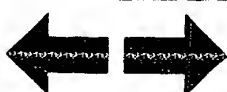


265 / 0232

E7

Test with ABS tester

Volvo 740/760



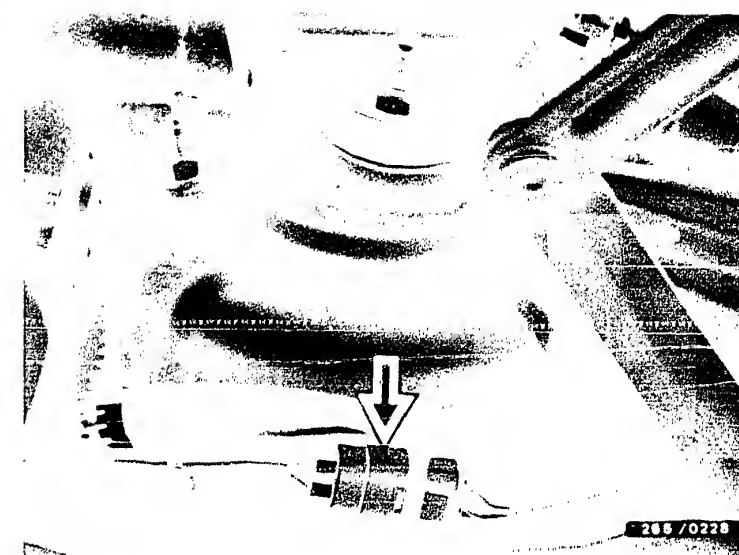
E8

Test with ABS tester

Volvo 740/760



TEST STEP 15		Reading:	Testing:
Operation:			
Program-selector switch position	12	Digital display unit: for FL and FR: <u>0 ... 100 mV</u>	<u>Component:</u> Wheel-speed sensors front left and front right
Press keys FL and FR one after the other	●		<u>Operation:</u> DC voltage on cable
<u>Operation in vehicle:</u> Switch on ignition	yes Continue test- ing with <u>next</u> <u>test step.</u>		<u>Malfunction:</u> Reading greater than 100 mV
	no		



Arrow = Wheel-speed sensor plug
connector

Top view of multiple plug K1 (35-pin)
with terminal numbers
Arrow = Lug with mechanical plug

Trouble-shooting (switch off ignition)

Plug-in connection O.K.?

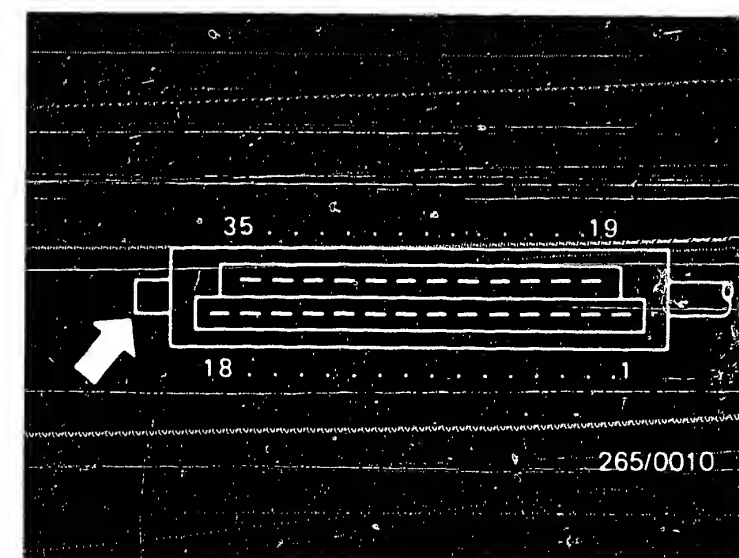
Undo plug connector and bridge the connector leading to the tester with a lead.

Repeat test: If reading is now O.K., replace wheel-speed sensor.

If reading is still under the set value, the leads from multiple plug term. 6 and term. 9 or term. 23 and 21 to the plug are defective.

Check all cables for wear and short circuit to ground.

Continued on E 11/E 12



E9

Test with ABS tester
Volvo 740/760



E10

Test with ABS tester
Volvo 740/760



Trouble-shooting - TEST STEP 15 (continued)

Remove wheel-speed sensors on front axle

- Plug connectors are in engine compartment on right/left on spring-strut crowns.
- Take apart plug connector.
- Loosen fastening screw for wheel-speed sensor and carefully remove wheel-speed sensor.
Do not use force.
- Loosen mountings of wheel-speed sensor cable and pull cable through rubber grommet in wheel house.

Install wheel-speed sensor on front axle.

- Check O-ring for cracks and replace if necessary.
- Only take new wheel-speed sensor out of protective sleeve when ready for mounting.
- Grease wheel-speed sensor housing lightly with Molykote Longterm 2.
- Make sure that no metallic foreign bodies are on the permanently magnetic edge.
- Carefully press wheel-speed sensor into mounting hole as far as it will go. Do not knock.
- Use new micro-encapsulaped fastening screws.
Tighten fastening screws to 6...8 Nm.
- Pull lead into engine compartment and re-fasten at the points provided.

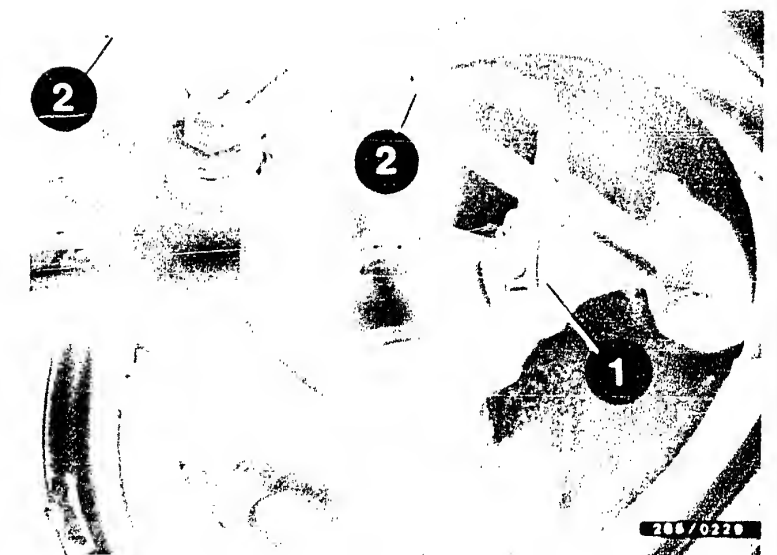
Note: The fastening points of the wheel-speed sensors are provided with color markings.

- Connect wheel-speed sensor to ABS wiring harness and fasten plug connector.
- After repairing, perform test with ABS tester.



Arrow = Wheel-speed sensor
plug connector

1 = Wheel-speed sensor
2 = Fastening point



E11

Test with ABS tester
Volvo 740/760



E12

Test with ABS tester
Volvo 740/760

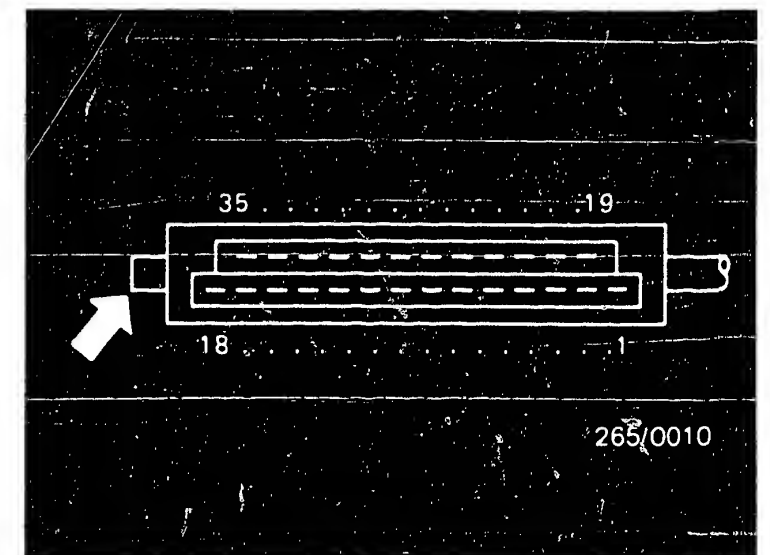


TEST STEP 16			
Operation:		Reading:	Testing:
Program-selector switch position	12	Digital display unit must indicate 0 ... 100 mV.	Component: Wheel-speed sensor for rear axle
Press keys RL and RR one after the other	●	yes ↓ no	Operation: DC voltage on line
Operation in vehicle: Switch on ignition		Continue testing with next test step.	Malfunction: Reading greater than 100 mV



- 1 = Wheel-speed sensor plug connector
2 = Tank filler neck

Top view of multiple plug K1 (35-pin) with terminal numbers.
Arrow = Lug with mechanical encoding



Trouble-shooting (switch off ignition)

Plug-in connection O.K.?

Undo plug connector and bridge the connector leading to the tester with a lead.

Repeat test: If reading is now O.K., replace wheel-speed sensor.

If reading is still under the set value, the leads from multiple plug term. 7 and term. 9 to the plug are defective.

Check all cables for wear and short circuit to ground.

Continued on E 15/E 16

E13

Test with ABS tester
Volvo 740/760



E14

Test with ABS tester
Volvo 740/760



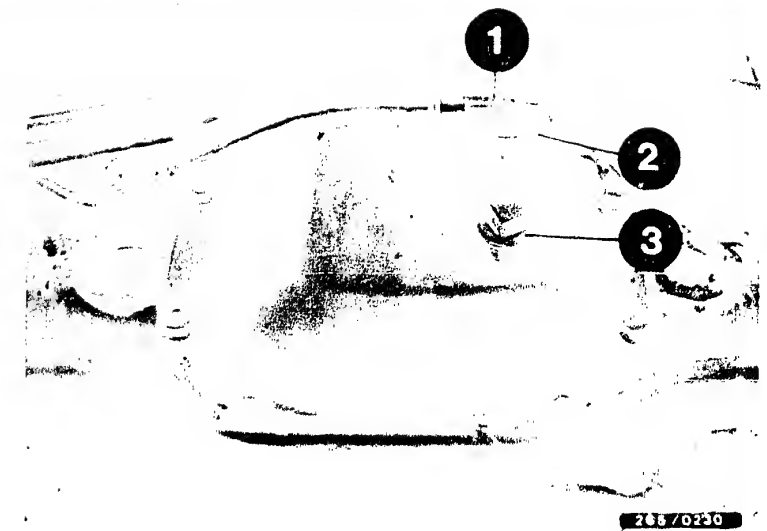
Trouble-shooting - TEST STEP 16 (continued)

Remove wheel-speed sensor on rear axle

- Take apart plug connector in luggage compartment:
- Loosen fastenings of lead and pull wheel-speed sensor lead downward through bottom of luggage compartment.
- Loosen fastening screw and pull out wheel-speed sensor.
Do not use force. Do not lose shim, use for re-installation.

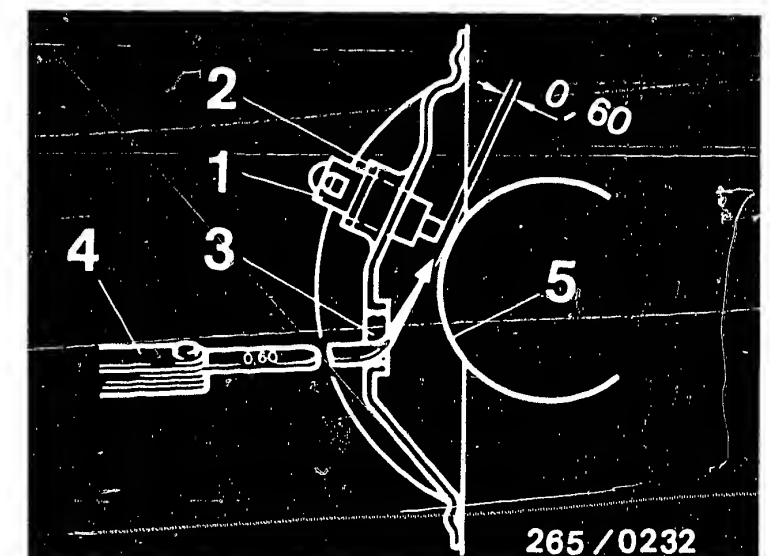
Install wheel-speed sensor on rear axle

- Check O-ring for cracks and replace if necessary.
- Only take new wheel-speed sensor out of protective sleeve when ready for mounting.
- Grease wheel-speed sensor housing lightly with Molykote Longterm 2. Mount shim(s).
- Make sure that no metallic foreign bodies are on the permanently magnetic edge.
- Carefully press wheel-speed sensor into mounting hole as far as it will go. Do not knock.
- Measure air gap between wheel-speed sensor edge and ring gear with feeler gauge. Should be: 0.35 ... 0.75 mm. If necessary, adjust air gap to nominal dimension 0.6 mm with shim. To measure the air gap, remove the oil-drain plug and introduce feeler gauge as shown. Turn drive bevel gear slightly. Shims are obtainable from Volvo agents in thicknesses between 1.0 and 1.8 mm in stages of 0.2 mm.
- Use new micro-encapsulated fastening screw.
Tighten fastening screws to 6 ... 8 Nm.
- Re-fasten lead at points provided.
- Connect wheel-speed sensor to ABS wiring harness.
- After repairing, perform test with ABS tester.



1=Wheel-speed sensor in rear-axle housing
2=Shim
3=Oil-drain plug

1=Wheel-speed sensor
2=Shim
3=Oil-drain plug
4=Feeler gauge
5=Drive bevel gear



E15

Test with ABS tester
Volvo 740/760

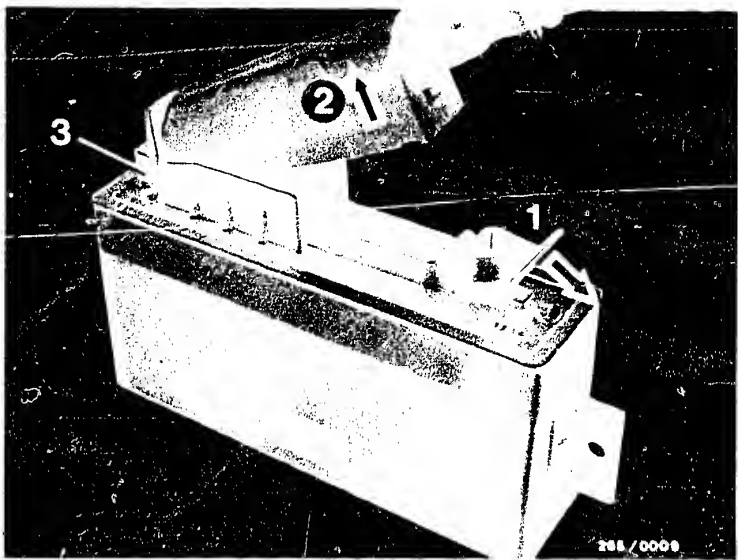


E16

Test with ABS tester
Volvo 740/760



TEST STEP 17				
Operation:		Reading:	Testing:	
Program-selector switch position	13	Digital display unit For control unit 0 265 101 014: 8.85 ... 9.15 V	Component: Controller	
Illuminated key lights up, press key	●	For control unit 0 265 101 013: 4.75 ... 5.25 V	Operation: Internal supply voltage	
Operation in vehicle: Switch on ignition		<div> <div>yes</div> <div>↓</div> </div> <div> <div>no</div> <div>↓</div> </div>	Malfunction: Voltage less than 8.85 V/4.75 V or greater than 9.15 V/5.25 V	
		Continue testing with next test step.		



- 1 = Spring
- 2 = Multiple plug (35-pin)
- 3 = Encoding block

Trouble-shooting:
Replace controller (switch off ignition).

- Notes:
- Switch off ignition before disconnecting multiple plug.
 - To disconnect multiple plug, press back spring, hinge up multiple plug and unhook from encoding block.
 - Remove control unit: Press holder apart with 2 screwdrivers and withdraw control unit.
 - Install only the specified controller.
 - When installing, make sure that multiple plug locks into spring.

TEST STEP 18		Reading:	Testing:
Operation:			
Program-selector switch position	14	Digital display unit must indicate 0.4 ... 1.5 V	Component: Hydraulic modulator and indicator lamp
Operation in vehicle: Switch on ignition		Check: ABS indicator lamp in vehicle must light up.	Operation: Diode in forward direction
		<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> yes Continue test- ing with <u>next</u> test step. </div> <div style="text-align: center;"> no ↓ </div> </div>	Malfunction: Reading less than 0.4 V or greater than 1.5 V. Indicator lamp does not light up.

Trouble-shooting (switch off ignition)

Indicator lamp does not light up:

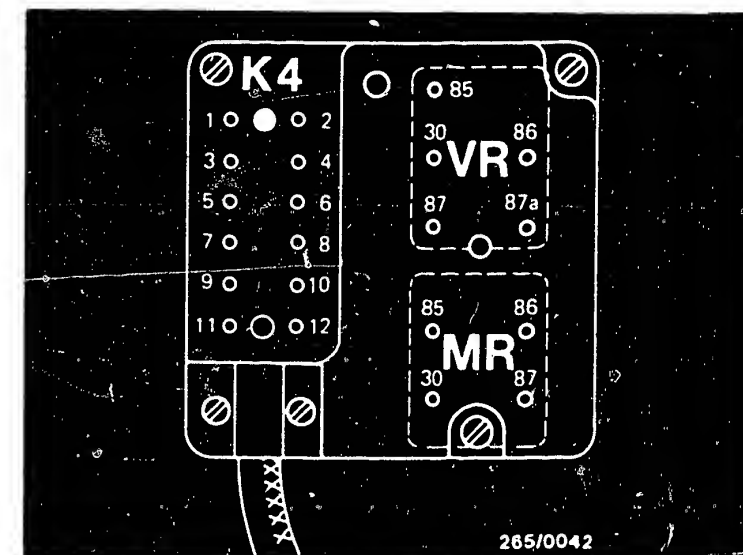
1. Indicator lamp defective.
2. Open circuit in cable to ignition lock.
3. Test leads from multiple plug K1/ term. 29 to hydraulic modulator K3/ term. 7 for open circuit.
4. Check diode in forward and reverse directions with test lamp between K4/term. 4 and K4/term. 7

Reading outside tolerance:

1. Check diode in forward and reverse directions with test lamp between K4/term. 4 and K4/term. 7
2. Test lead between multiple plug K1/ term. 29 and ABS indicator lamp for open circuit.
3. Check for voltage drop at plug-in connections on indicator lamp, K3/term. 7, K4/term. 7, K3/term. 8, K4/term. 8 as well as ground cable and valve relay plug-in connections.

If diode defective, replace hydraulic modulator.

Continued on E 21/E 22



Top view of plug-in plate of hydraulic modulator

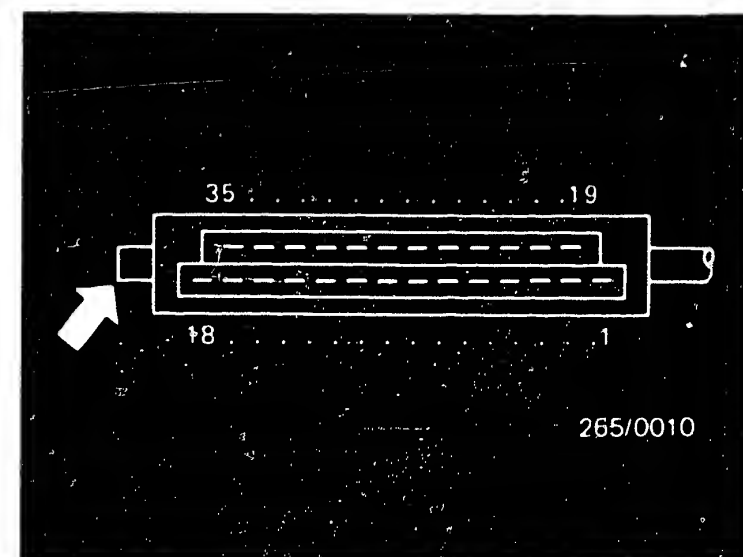
VR = Valve relay

MR = Return-pump relay

K4 = Wiring harness plug

Top view of multiple plug K1 (35-pin) with terminal numbers

Arrow = Lug with mechanical plug



E19

Test with ABS tester

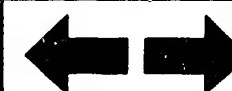
Volvo 740/760



E20

Test with ABS tester

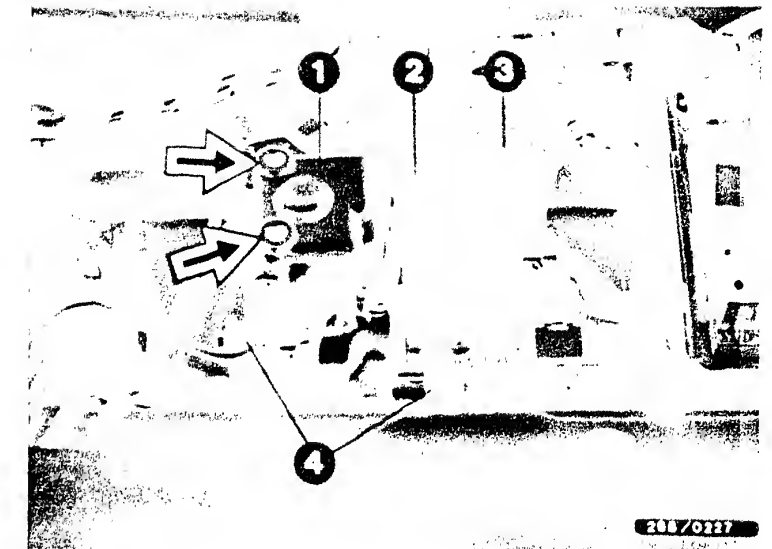
Volvo 740/760



Trouble-shooting - TEST STEP 18 (continued)

Removing the hydraulic modulator

- For safety reasons, the hydraulic modulator must not be repaired, but the complete unit must be replaced.
Exceptions to this are the return-pump relay and the valve relay. Both relays may be replaced.
- Apart from the brake-line connections no screws on the hydraulic modulator may be loosened. The hexagon-socket-head cap screws (arrows) may under no circumstances be loosened. After loosening, the brake circuits can no longer be got free of leaks or the brake circuits can no longer be bled.
Danger!
- Check the hydraulic modulator and brake-line connections for leaks by means of a visual examination. If brake fluid is escaping, tighten the brake-line connections (12...16 Nm) or replace, or replace the hydraulic modulator.



- 1 = Hydraulic modulator
- 2 = Valve relay
- 3 = Return-pump relay
- 4 = Fastening

Continued on E 23/E 24

E21

Test with ABS tester

Volvo 740/760



E22

Test with ABS tester

Volvo 740/760



Trouble-shooting - TEST STEP 18 (continued)

Pay particular attention to the joints identified by arrows.
On the base of the hydraulic modulator there is a vent hole to the pump pistons. A slight escape of brake fluid at this point is possible.

A complaint is only justified if, after pressing the brake pedal several times, a pool of brake fluid is formed under the hydraulic modulator.

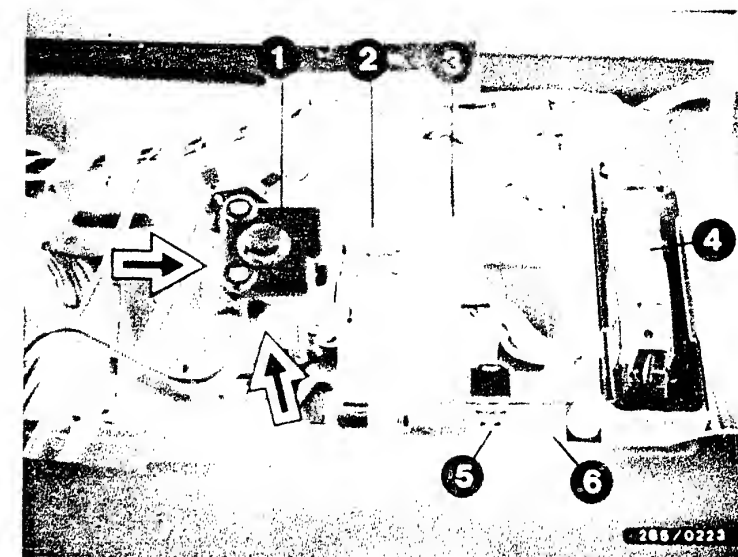
- When removing and installing the brake lines, make sure that the lines are marked in accordance with the markings on the hydraulic modulator and that they are not mixed up when re-connecting (e.g. FL of hydraulic modulator must be connected to the front left wheel brake cylinder).

- Markings on hydraulic modulator:

l = Connection for brake line front left (wheel-brake cylinder)
r = Connection for brake line front right (wheel-brake cylinder)
h = Connection for brake line of rear axle

V = Front axle brake circuit from brake master cylinder
H = Rear axle brake circuit from brake master cylinder

Continued on F 1/F 2



1=Hydraulic modulator
2=Valve relay
3=Motor relay
Arrows=Joints

E23

Test with ABS tester
Volvo 740/760



E24

Test with ABS tester
Volvo 740/760

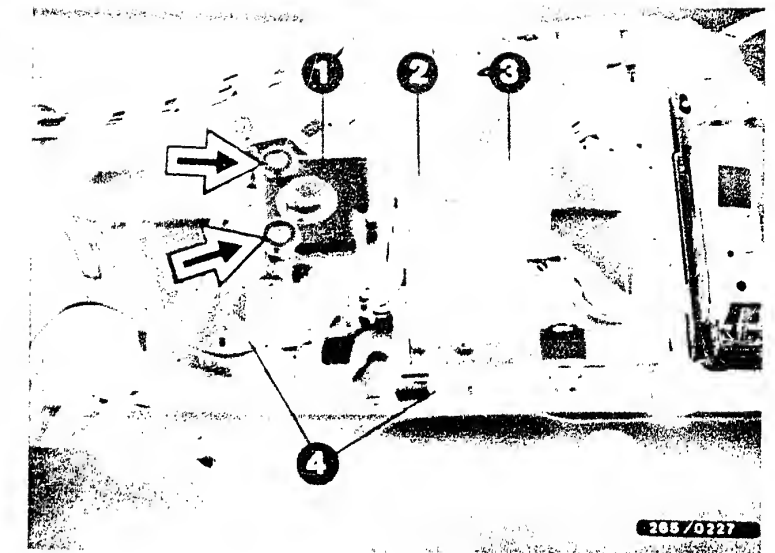


Trouble-shooting - TEST STEP 18 (continued)

- Use only the specified double-end flare nut wrench 9x11 mm for loosening and tightening the brake lines.
- Mark brake lines and remove from hydraulic modulator.
- Catch the brake fluid and do not bring it into contact with your skin or clothing or with paintwork.
- Immediately seal the brake lines and connections with dummy plugs.
- Disconnect ground cable from pump motor.
- Loosen fastening screw and remove cover.
- Loosen bracket and remove plug.
- Loosen hexagon nuts from holder and remove hydraulic modulator.

Installation

- Mount hydraulic modulator in the holder and fasten with the hexagon nuts.
- Connect ground cable to pump motor. Plug on 12-pin plug and fasten with the bracket.
- Fasten cover on the hydraulic modulator with the screw.
- Connect the brake lines to the hydraulic modulator in accordance with the markings.
- Note tightening torque for brake line connections on hydraulic modulator: 12...16 Nm.
- Bleed the brake system and check for leaks.
- Fully test the ABS with the tester.



- 1 = Hydraulic modulator
- 2 = Valve relay
- 3 = Return-pump relay
- 4 = Fastening

F1

Test with ABS tester
Volvo 740/760



F2

Test with ABS tester
Volvo 740/760

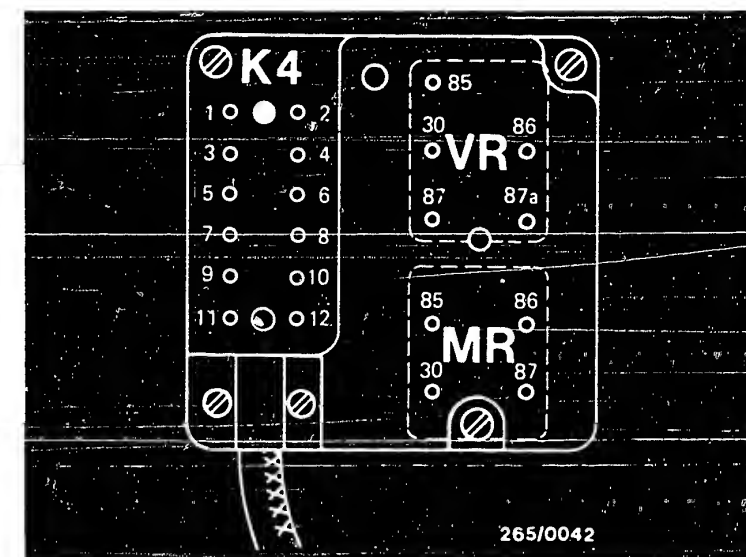


TEST STEP 19		Reading:	Testing:
Operation:			
Program-selector switch position	15	Digital display unit must indicate: 2.5 ... 8.5 V	Component: Hydraulic modulator
Operation in vehicle: Switch on ignition		Note: ABS indicator lamp slightly dimmer. Valve relay switches. <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> yes ↓ Continue testing with next test step. </div> <div style="text-align: center;"> no ↓ </div> </div>	Operation: Diode in reverse direction Malfunction: Reading less than 2.5 V or greater than 8.5 V

Trouble-shooting (switch off ignition):

Reading outside tolerance:
Check diode in forward and reverse directions with test lamp between K4/term.10 and K4/term.12.
If diode defective, replace hydraulic modulator.

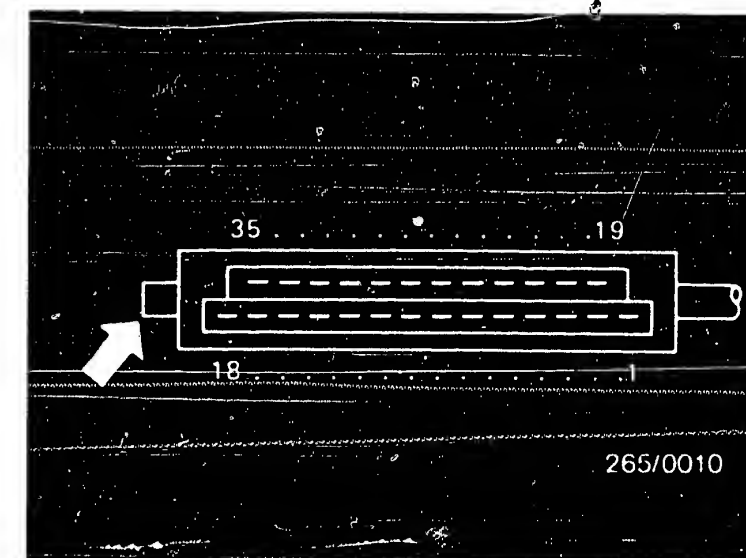
Continued on F 5/F 6



Top view of plug-in plate of hydraulic modulator

VR = Valve relay
MR = Return-pump relay
K4 = Wiring harness plug

Top view of multiple plug K1 (35-pin) with terminal numbers
Arrow = Lug with mechanical encoding



F3

Test with ABS tester
Volvo 740/760



F4

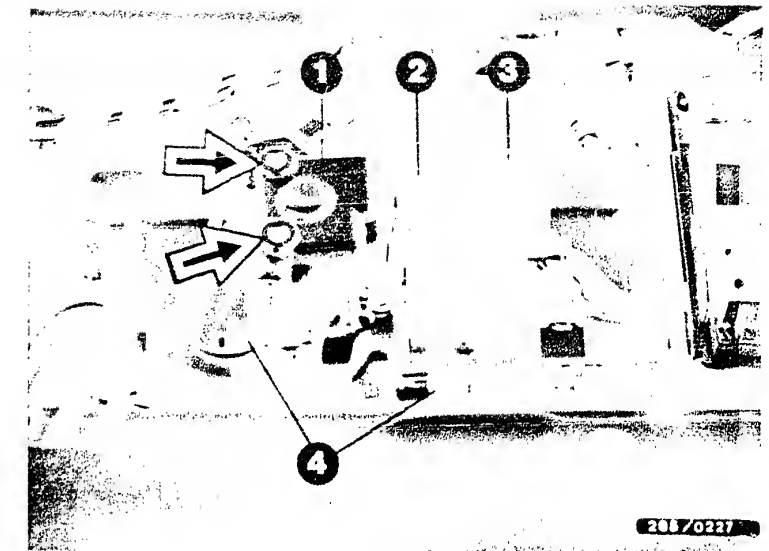
Test with ABS tester
Volvo 740/760



Trouble-shooting - TEST STEP 19 (continued)

Removing the hydraulic modulator

- For safety reasons, the hydraulic modulator must not be repaired, but the complete unit must be replaced.
Exceptions to this are the return-pump relay and the valve relay. Both relays may be replaced.
- Apart from the brake-line connections no screws on the hydraulic modulator may be loosened. The hexagon-socket-head cap screws (arrows) may under no circumstances be loosened. After loosening, the brake circuits can no longer be got free of leaks or the brake circuits can no longer be bled.
Danger!
- Check the hydraulic modulator and brake-line connections for leaks by means of a visual examination. If brake fluid is escaping, tighten the brake-line connections (12...16 Nm) or replace, or replace the hydraulic modulator.



- 1 = Hydraulic modulator
- 2 = Valve relay
- 3 = Return-pump relay
- 4 = Fastening

Continued on F 7/F 8

F5

Test with ABS tester
Volvo 740/760



F6

Test with ABS tester
Volvo 740/760



Trouble-shooting - TEST STEP 19 (continued)

Pay particular attention to the joints identified by arrows. On the base of the hydraulic modulator there is a vent hole to the pump pistons. A slight escape of brake fluid at this point is possible.

A complaint is only justified if, after pressing the brake pedal several times, a pool of brake fluid is formed under the hydraulic modulator.

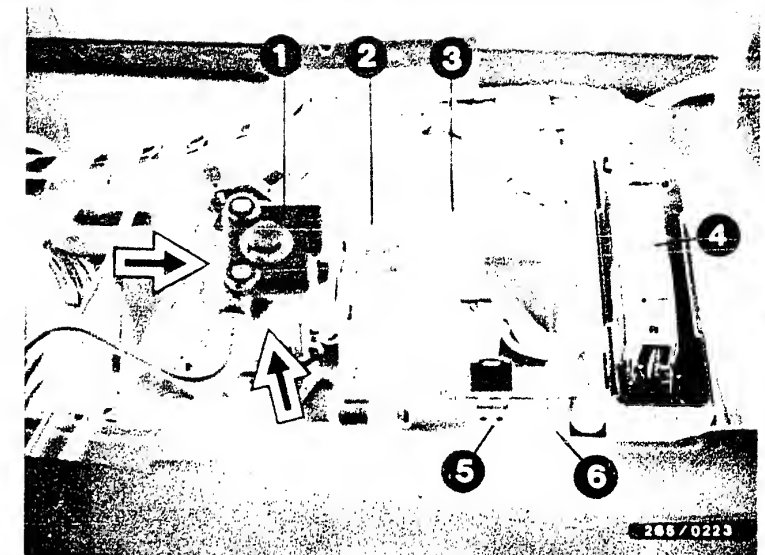
- When removing and installing the brake lines, make sure that the lines are marked in accordance with the markings on the hydraulic modulator and that they are not mixed up when re-connecting (e.g. FL of hydraulic modulator must be connected to the front left wheel brake cylinder).

- Markings on hydraulic modulator:

l = Connection for brake line front left (wheel-brake cylinder)
r = Connection for brake line front right (wheel-brake cylinder)
h = Connection for brake line of rear axle

V = Front axle brake circuit from brake master cylinder
H = Rear axle brake circuit from brake master cylinder

Continued on F 9/F 10



1 = Hydraulic modulator
2 = Valve relay
3 = Motor relay
Arrows = Joints

F7

Test with ABS tester

Volvo 740/760



F8

Test with ABS tester

Volvo 740/760

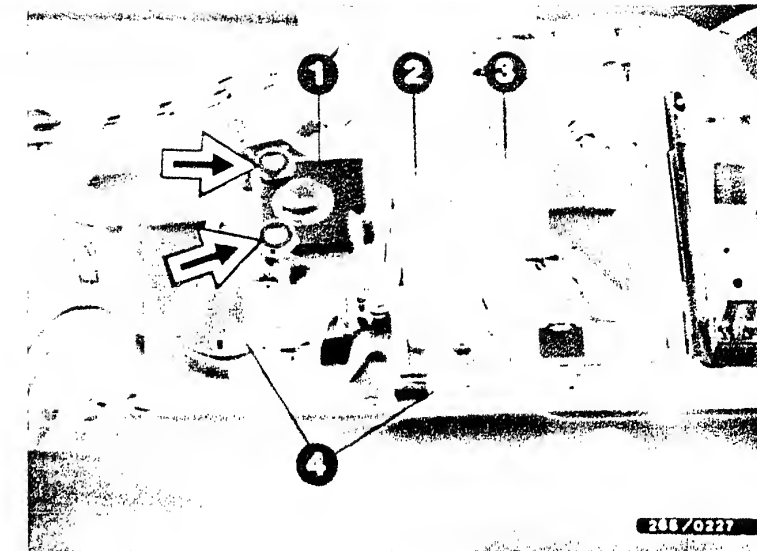


Trouble-shooting - TEST STEP 19 (continued)

- Use only the specified double-end flare nut wrench 9x11 mm for loosening and tightening the brake lines.
- Mark brake lines and remove from hydraulic modulator.
- Catch the brake fluid and do not bring it into contact with your skin or clothing or with paintwork.
- Immediately seal the brake lines and connections with dummy plugs.
- Disconnect ground cable from pump motor.
- Loosen fastening screw and remove cover.
- Loosen bracket and remove plug.
- Loosen hexagon nuts from holder and remove hydraulic modulator.

Installation

- Mount hydraulic modulator in the holder and fasten with the hexagon nuts.
- Connect ground cable to pump motor. Plug on 12-pin plug and fasten with the bracket.
- Fasten cover on the hydraulic modulator with the screw.
- Connect the brake lines to the hydraulic modulator in accordance with the markings.
- Note tightening torque for brake line connections on hydraulic modulator: 12...16 Nm.
- Bleed the brake system and check for leaks.
- Fully test the ABS with the tester.



- 1 = Hydraulic modulator
- 2 = Valve relay
- 3 = Return-pump relay
- 4 = Fastening

F9

Test with ABS tester

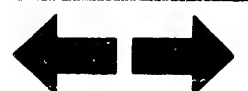
Volvo 740/760

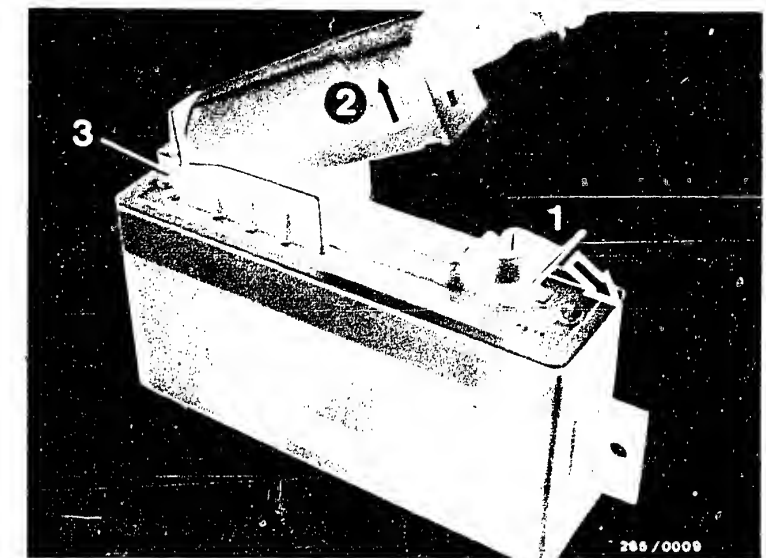


F10

Test with ABS tester

Volvo 740/760





1 = Spring
 2 = Multiple plug (35-pin)
 3 = Encoding block

TEST STEP 20		Reading:	Testing:
Operation:			
Program-selector switch position	16	Watch ABS indicator lamp in vehicle: After pressing the illuminated key the lamp must go out within 1 second	Component: Controller
Illuminated key lights up. Press key for at least 3 seconds.	●	<div> <div>yes</div> <div>↓</div> </div> <div>no</div>	Operation: BITE* triggering
Operation in vehicle: Switch off ignition		Continue test- ing with next test step.	Malfunction: Indicator lamp does not go out

Trouble-shooting:

1. Repeat test step with engine running.
2. Replace controller (switch off ignition beforehand).

Notes:

- Switch off ignition before disconnecting multiple plug.
- To disconnect multiple plug, press back spring, hinge up multiple plug and unhook from encoding block.
- Remove control unit: Press holder apart with 2 screwdrivers and withdraw control unit.
- Install only the specified controller.
- When installing, make sure that multiple plug locks into spring.

*BITE = Built-in test circuit

F11

Test with ABS tester
 Volvo 740/760

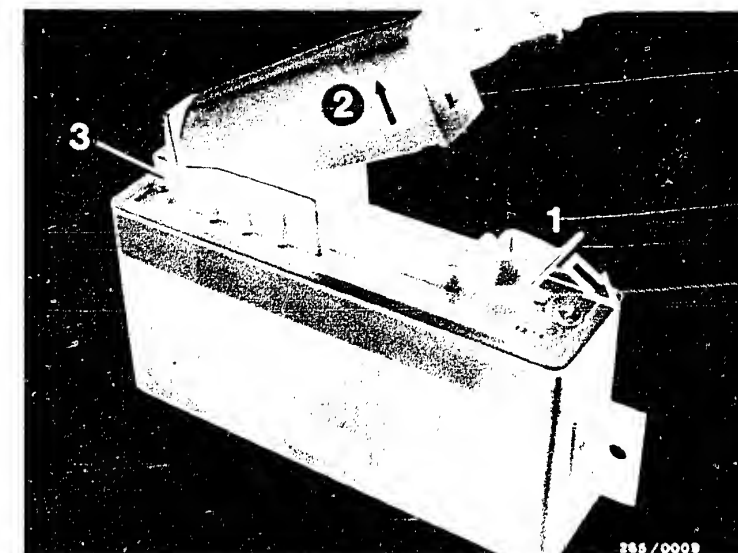


F12

Test with ABS tester
 Volvo 740/760



TEST STEP 21		
Operation:		Reading:
Program-selector switch position	17	Watch ABS indicator lamp in vehicle: Lamp <u>must</u> light up as long as key is pressed (brief flickering after approx. 1 second allowable).
Illuminated key lights up. Press key for at least 3 seconds.	●	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> yes ↓ </div> <div style="text-align: center;"> no ↓ </div> </div>
Operation in vehicle: Switch on ignition		Continue testing with <u>next</u> test step.
		Component: Controller Operation: BITE* program with fault simulation Malfunction: Indicator lamp goes out.



- 1 = Spring
2 = Multiple plug (35-pin)
3 = Encoding block

Trouble-shooting:

1. Repeat test step with engine running.
2. Replace controller (switch off ignition beforehand).

Notes:

- Switch off ignition before disconnecting multiple plug.
- To disconnect multiple plug, press back spring, hinge up multiple plug and unhook from encoding block.
- Remove control unit: Press holder apart with 2 screwdrivers and withdraw control unit.
- Install only the specified controller.
- When installing, make sure that multiple plug locks into spring.

*BITE = Built-in test circuit

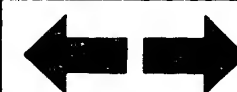
F13

Test with ABS tester
Volvo 740/760

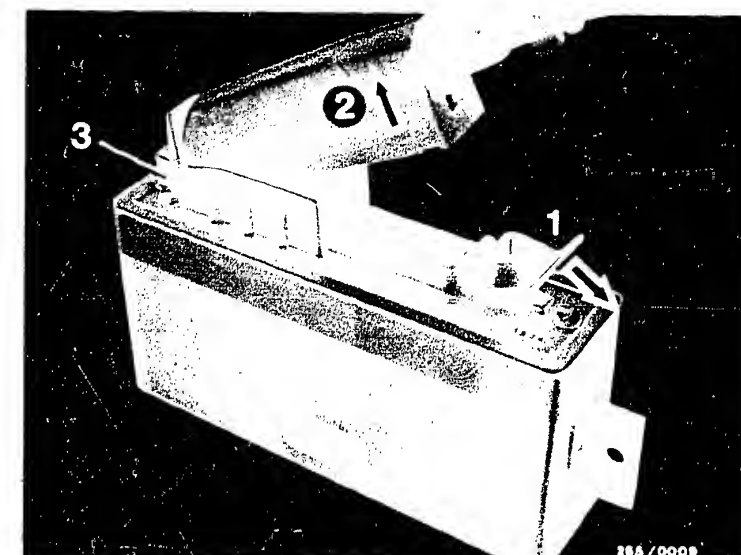


F14

Test with ABS tester
Volvo 740/760



TEST STEP 22			
Operation:		Reading:	Testing:
Program-selector switch position	18	Digital display unit must indicate	Component: Controller
Press key FL	●	<u>1,9...2,3 A</u> Note: Pump motor starts up.	
Illuminated key lights up. Press key. (Reading must be at zero before pressing the key).	●	<div><div>yes</div><div>↓</div></div> <div><div>no</div><div>↓</div></div>	Operation: Valve current. Pressure holding front left
Operation in vehicle: Switch on ignition		Continue test- ing with <u>next</u> test step.	Malfunction: Current less than 1.9 A or greater than 2.3 A



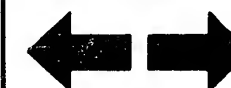
- 1 = Spring
2 = Multiple plug (35-pin)
3 = Encoding block

Trouble-shooting:

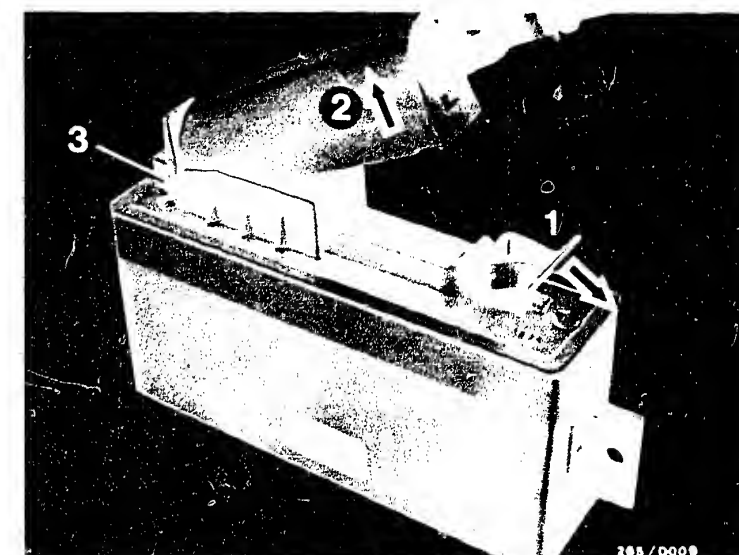
1. Repeat test step with engine running.
2. Replace controller (switch off ignition beforehand).

Notes:

- Display jumps to zero after a few seconds.
If the test step is to be repeated, press the key again.
- Switch off ignition before disconnecting multiple plug.
- To disconnect multiple plug, press back spring, hinge up multiple plug and unhook from encoding block.
- Remove control unit: Press holder apart with 2 screwdrivers and withdraw control unit.
- Install only the specified controller.
- When installing, make sure that multiple plug locks into spring.



TEST STEP 23		Reading:	Testing:
Operation:			
Program-selector switch position	18	Digital display unit must indicate <u>1,9...2,3 A</u>	Component: Controller
Press key FR	●	Note: Pump motor starts up.	Operation:
Illuminated key lights up. Press key. (Reading must be at zero before pressing the key).	●	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> yes ↓ </div> <div style="text-align: center;"> no ↓ </div> </div>	Valve current. Pressure holding front right
Operation in vehicle: Switch on ignition		Continue test- ing with <u>next</u> test step.	Malfunction: Current less than 1.9A or greater than 2.3A



- 1 = Spring
2 = Multiple plug (35-pin)
3 = Encoding block

Trouble-shooting:

1. Repeat test step with engine running.
2. Replace controller (switch off ignition beforehand).

Notes:

- Display jumps to zero after a few seconds.
If the test step is to be repeated, press the key again.
- Switch off ignition before disconnecting multiple plug.
- To disconnect multiple plug, press back spring, hinge up multiple plug and unhook from encoding block.
- Remove control unit: Press holder apart with 2 screwdrivers and withdraw control unit.
- Install only the specified controller.
- When installing, make sure that multiple plug locks into spring.

F17

Test with ABS tester
Volvo 740/760

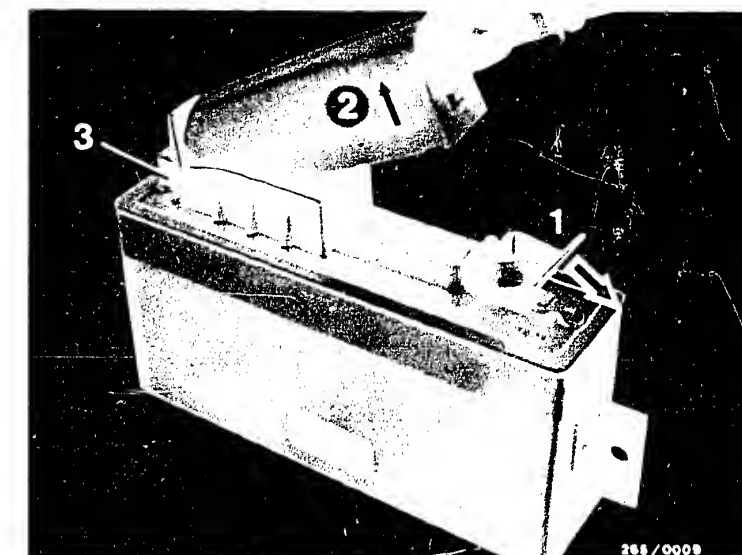


F18

Test with ABS tester
Volvo 740/760



TEST STEP 24		Reading:	Testing:
Operation:			
Program-selector switch position	18	Digital display unit must indicate 1,9 ... 2,3 A	Component: Controller
Press key RA	●	Note: Pump motor starts up.	Operation:
Illuminated key lights up. Press key. (Reading must be at zero before pressing the key).	●	<div style="display: flex; justify-content: space-between;"> <div style="text-align: center;"> yes ↓ Continue test- ing with <u>next</u> test step. </div> <div style="text-align: center;"> no ↓ </div> </div>	Valve current. Pressure holding - rear axle
Operation in vehicle: Switch on ignition			Malfunction: Current less than 1.9 A or greater than 2.3 A



- 1 = Spring
2 = Multiple plug (35-pin)
3 = Encoding block

Trouble-shooting:

1. Repeat test step with engine running.
2. Replace controller (switch off ignition beforehand).

Notes:

- Display jumps to zero after a few seconds.
If the test step is to be repeated, press the key again.
- Switch off ignition before disconnecting multiple plug.
- To disconnect multiple plug, press back spring, hinge up multiple plug and unhook from encoding block.
- Remove control unit: Press holder apart with 2 screwdrivers and withdraw control unit.
- Install only the specified controller.
- When installing, make sure that multiple plug locks into spring.

F19

Test with ABS tester
Volvo 740/760



F20

Test with ABS tester
Volvo 740/760



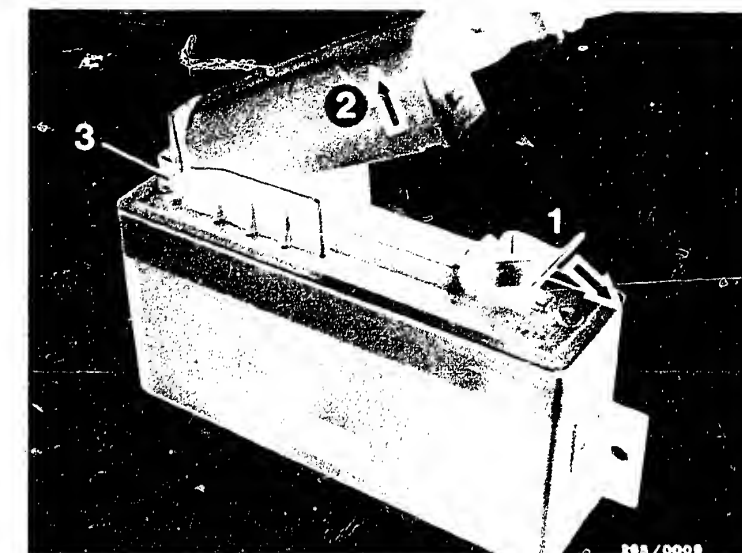
TEST STEP 25			
Operation:		Reading:	Testing:
Program-selector switch position	19	Digital display unit must indicate	Component: Controller
Press key FL	●	4,5...6,0 A Note: Pump motor starts up.	
Illuminated key lights up. Press key. (Reading must be at zero before pressing the key)	●	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> yes ↓ Continue test- ing with next test step. </div> <div style="text-align: center;"> no ↓ </div> </div>	Operation: Valve current, pressure reduction front left
Operation in vehicle: Switch on ignition			Malfunction: Current less than 4.5 A or greater than 6,0 A.

Trouble-shooting:

1. Repeat test step with engine running.
2. Replace controller (switch off ignition beforehand).

Notes:

- Display jumps to zero after a few seconds.
If the test step is to be repeated, press the key again.
- Switch off ignition before disconnecting multiple plug.
- To disconnect multiple plug, press back spring, hinge up multiple plug and unhook from encoding block.
- Remove control unit: Press holder apart with 2 screwdrivers and withdraw control unit.
- Install only the specified controller.
- When installing, make sure that multiple plug locks into spring.



- 1 = Spring
2 = Multiple plug (35-pin)
3 = Encoding block

F21

Test with ABS tester
Volvo 740/760

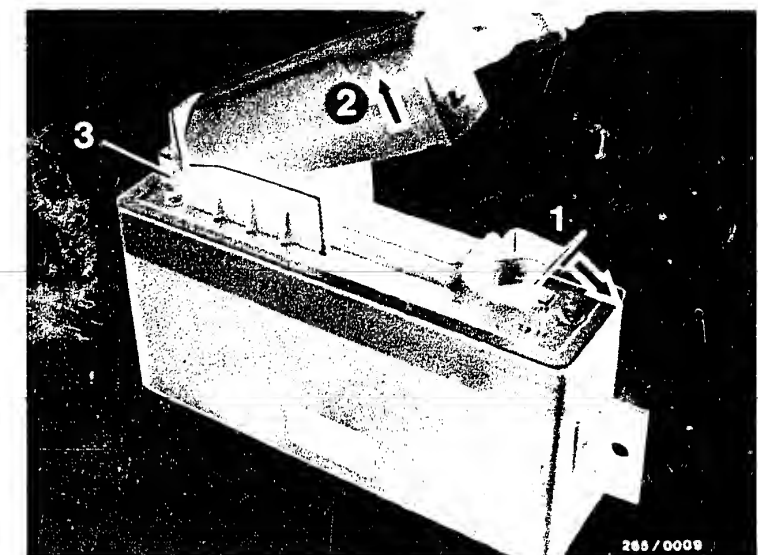


F22

Test with ABS tester
Volvo 740/760



TEST STEP 26			
Operation:		Reading:	Testing:
Program-selector switch position	19	Digital display unit must indicate <u>4,5...6,0 A</u>	Component: Controller
Press key FR	●	Note: Pump motor starts up.	Operation: Valve current, pressure reduction front right
Illuminated key lights up. Press key. (Reading must be at zero before pressing the key)	●	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> yes ↓ Continue test- ing with <u>next</u> test step. </div> <div style="text-align: center;"> no ↓ </div> </div>	Malfunction: Current less than 4,5 A or greater than 6,0 A.
Operation in vehicle: Switch on ignition			



- 1 = Spring
2 = Multiple plug (35-pin)
3 = Encoding block

Trouble-shooting:

1. Repeat test step with engine running.
2. Replace controller (switch off ignition beforehand).

Notes:

- Display jumps to zero after a few seconds.
If the test step is to be repeated, press the key again.
- Switch off ignition before disconnecting multiple plug.
- To disconnect multiple plug, press back spring, hinge up multiple plug and unhook from encoding block.
- Remove control unit: Press holder apart with 2 screwdrivers and withdraw control unit.
- Install only the specified controller.
- When installing, make sure that multiple plug locks into spring.

F23

Test with ABS tester
Volvo 740/760

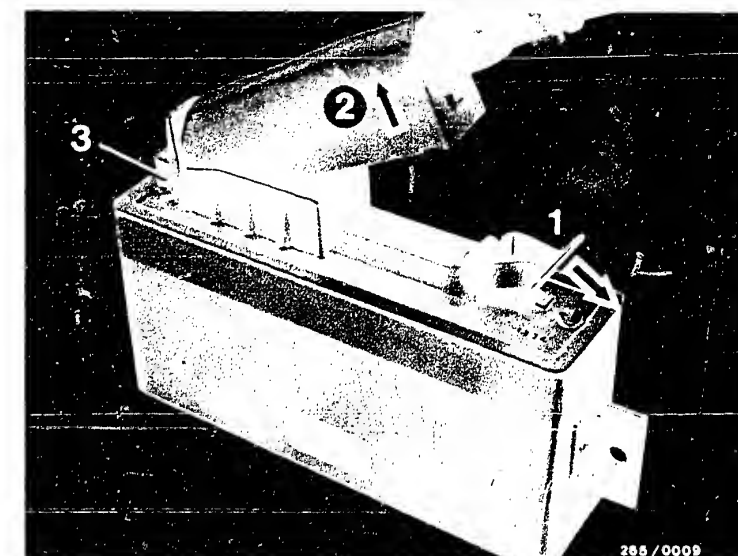


F24

Test with ABS tester
Volvo 740/760



TEST STEP 27			
Operation:		Reading:	Testing:
Program-selector switch position	19	Digital display unit must indicate 4,5...6,0 A	Component: Controller
Press key RA	●	Note: Pump motor starts up.	
Illuminated key lights up. Press key. (Reading must be at zero before pressing the key)	●	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> yes ↓ Continue test- ing with <u>next</u> test step. </div> <div style="text-align: center;"> no ↓ </div> </div>	Operation: Valve current, Pressure reduction - rear axle
Operation in vehicle: Switch on ignition			Malfunction: Current less than 4.5 A or greater than 6,0 A.



- 1 = Spring
2 = Multiple plug (35-pin)
3 = Encoding block

Trouble-shooting:

1. Repeat test step with engine running.
2. Replace controller (switch off ignition beforehand).

Notes:

- Display jumps to zero after a few seconds.
If the test step is to be repeated, press the key again.
- Switch off ignition before disconnecting multiple plug.
- To disconnect multiple plug, press back spring, hinge up multiple plug and unhook from encoding block.
- ~~Remove~~ control unit: Press holder apart with 2 screwdrivers and withdraw control unit.
- Install only the specified controller.
- When installing, make sure that multiple plug locks into spring.

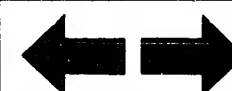
G1

Test with ABS tester
Volvo 740/760



G2

Test with ABS tester
Volvo 740/760



TEST STEP 28		Reading:	Testing:
Operation:			
Program-selector switch position	24	Digital display unit must indicate <u>10 ... 15 V</u>	Component: Stop-lamp switch
Operation in vehicle: Switch on ignition. Press brake pedal.			Operation: Voltage at term. 25
		<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> yes Continue test- ing with <u>next</u> test step. </div> <div style="text-align: center;"> no ↓ </div> </div>	Malfunction: Reading less than 10 V

Note: Tester must be converted for generation 2B.

Trouble-shooting:

No reading: Check stop-lamp switch including plug connectors (in right-hand door hinge column no. 7) and leads.

Reading less than 10 V: Stop lamps defective, eliminate contact resistances at plug connectors or replace stop-lamp switch.

Continued on G 5

G3

Test with ABS tester
Volvo 740/760



G4

Test with ABS tester
Volvo 740/760



A dynamic brake analyzer (DBA) is necessary for program-selector switch positions 20, 21, 22 and 23.

Caution:

Do not drive with the tester connected.

Do not use a brake-pedal actuating device for setting the brake-pedal force.

Bring test step - program switch position 23 - forward since the following test steps presuppose that the wheel-speed sensors are in good condition. When changing channels wait at least 20 seconds (internal tester program must have run).

Be sure to keep to the sequence of operations:
Start testing with front axle.

G5

Test with ABS tester

Volvo 740/760



TEST STEP 29

Operation:		Reading:	Testing:
Program-selector switch position	23	Digital display unit must indicate <u>1,8 ... 19</u>	Component: Wheel-speed sensor <u>front left</u>
Additional operations: <ul style="list-style-type: none"> • Drive front wheels of vehicle onto dynamic brake analyzer • Pull on the handbrake. Caution! In vehicles with automatic transmission make sure that selector lever is not in parking position (P). <ul style="list-style-type: none"> • Switch on the ignition. • Select wheel FL with key FL. • Switch on <u>left-hand</u> brake roller. • Make reading. 		In case of fluctuating readings, the lowest reading is valid. Note: If reading is 1,8, check air gap.	Operation: Signal and mixing up of connecting cables
		<div> <div>yes</div> <div>Continue test- ing with <u>next</u> test step.</div> </div> <div>no</div>	Malfunction: Reading less than 1,8 or greater than 19

Trouble-shooting (switch off ignition)

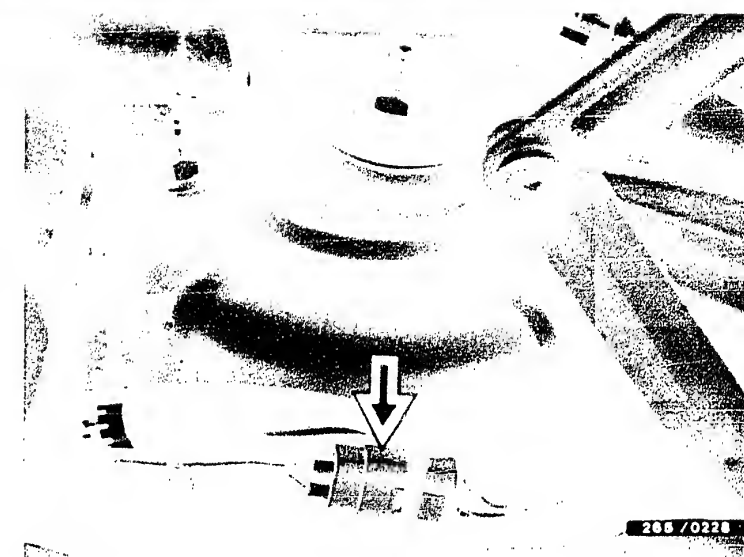
A reading of 999 signifies:

- Speed of dynamic brake analyzer too great (above approx. 13 km/h).

Reading 0 or less than 1,8:

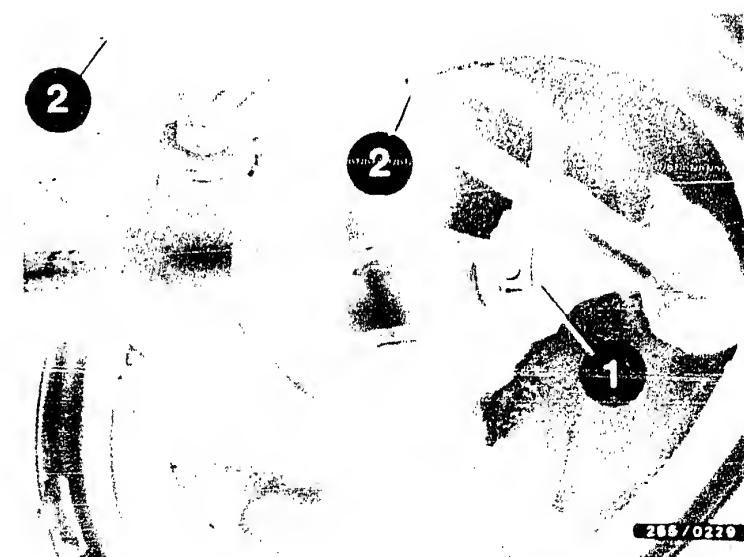
- Wheel-speed sensors mixed up? Check assignment:
Wheel-speed sensors must be connected to the specified wheel and controller input (see circuit diagram).
- Air gap between wheel-speed sensor and ring gear too great. Check installation.
- Check wheel bearing play.
- Replace wheel-speed sensor.

Continued on G 8/G 9



Arrow = Wheel-speed sensor plug connector

1 = Wheel-speed sensor
2 = Fastening points



G6

Test with ABS tester
Volvo 740/760



G7

Test with ABS tester
Volvo 740/760



Trouble-shooting - TEST STEP 29 (continued)

Remove wheel-speed sensors on front axle

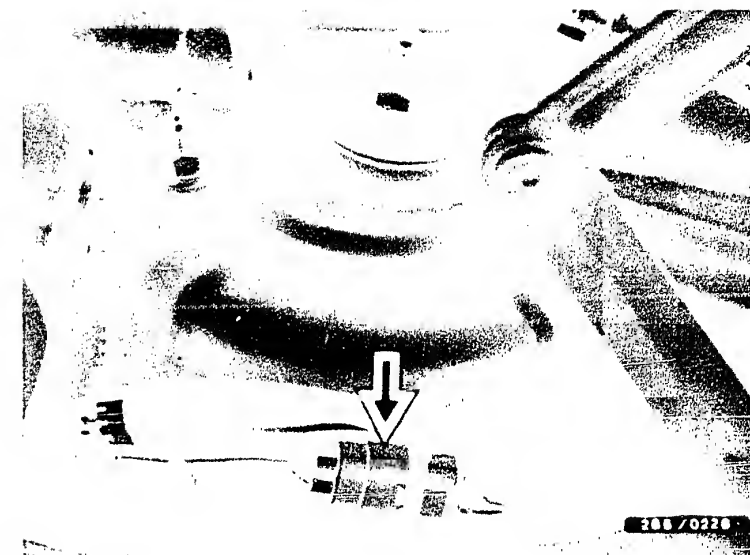
- Plug connectors are in engine compartment on right/left on spring-strut crowns.
- Take apart plug connector.
- Loosen fastening screw for wheel-speed sensor and carefully remove wheel-speed sensor.
Do not use force.
- Loosen mountings of wheel-speed sensor cable and pull cable through rubber grommet in wheel house.

Install wheel-speed sensor on front axle.

- Check O-ring for cracks and replace if necessary.
- Grease wheel-speed sensor housing lightly with Molykote Longterm 2.
- Carefully press wheel-speed sensor into mounting hole as far as it will go. Do not knock.
- Use new micro-encapsulaped fastening screws.
Tighten fastening screws to 6...8 Nm.
- Pull lead into engine compartment and re-fasten at the points provided.

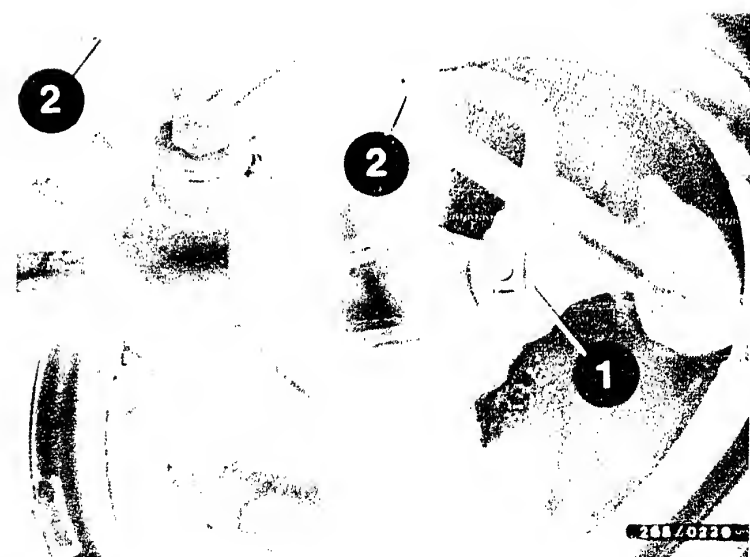
Note: The fastening points of the wheel-speed sensor lead are provided with color markings.

- Connect wheel-speed sensor to ABS wiring harness and fasten plug connector.
- After repairing, perform test with ABS tester.



Arrow = Wheel-speed sensor
plug connector

1 = Wheel-speed sensor
2 = Fastening points



G8

Test with ABS tester
Volvo 740/760

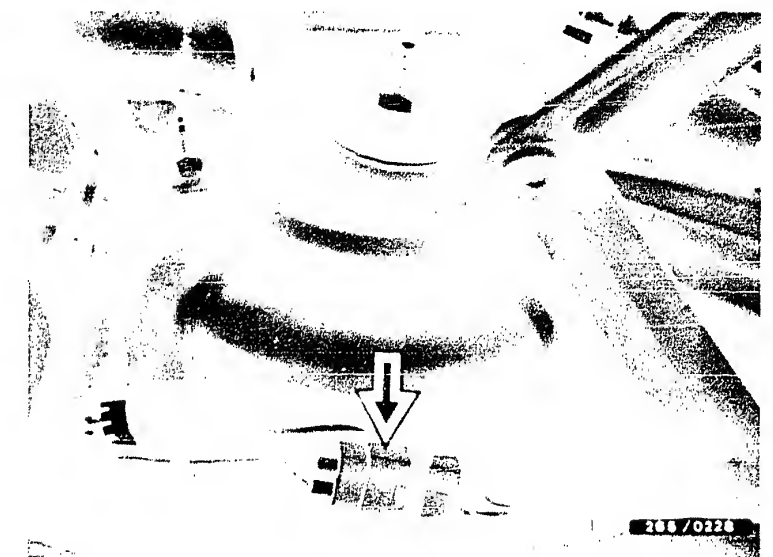


G9

Test with ABS tester
Volvo 740/760

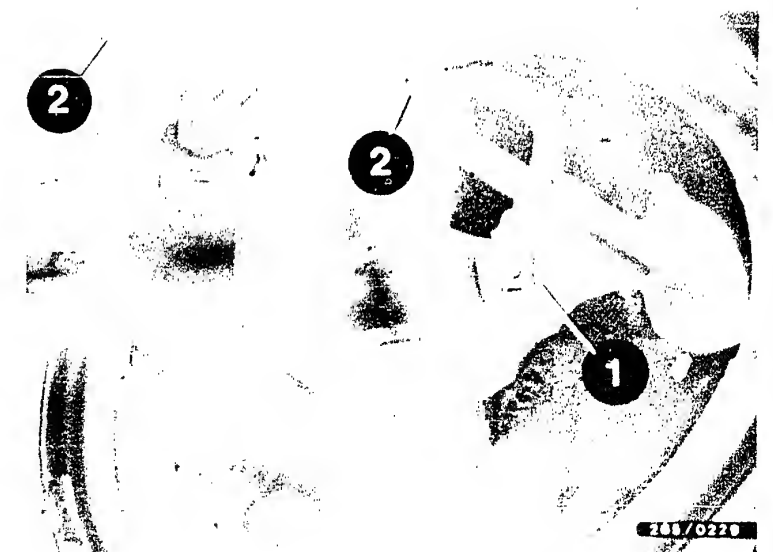


TEST STEP 30		Reading:	Testing:
Operation:			
Program-selector switch position	23	Digital display unit must indicate <u>1,8 ... 19</u>	Component: <u>Wheel-speed sensor front right</u>
<u>Additional operations:</u> <ul style="list-style-type: none"> • Drive front wheels of vehicle onto dynamic brake analyzer • Pull on the handbrake. <u>Caution:</u> In vehicles with automatic transmission make sure that selector lever is not in parking position (P). <ul style="list-style-type: none"> • Switch on the ignition. • Select wheel FR with key FR. • Switch on <u>right-hand brake roller</u> only. • Make reading. 		In case of fluctuating readings, the lowest reading is valid. <u>Note:</u> If reading is 1,9, check air gap.	<u>Operation:</u> Signal and mixing up of connecting cables
		yes Continue testing with <u>next test step.</u>	<u>Malfunction:</u> Reading less than 1,8 or greater than 19



Arrow = Wheel-speed sensor plug connector

1 = Wheel-speed sensor
2 = Fastening points



Trouble-shooting (switch off ignition)

A reading of 999 signifies:

- Speed of dynamic brake analyzer too great (above approx. 13 km/h).

Reading 0 or less than 1,8

- Wheel-speed sensors mixed up? Check assignment:
Wheel-speed sensors must be connected to the specified wheel and controller input (see circuit diagram).
- Air gap between wheel-speed sensor and ring gear too great. Check installation.
- Check wheel bearing play.
- Replace wheel-speed sensor.

Continued on G 12/G 13



Trouble-shooting - TEST STEP 30 (continued)

Remove wheel-speed sensors on front axle

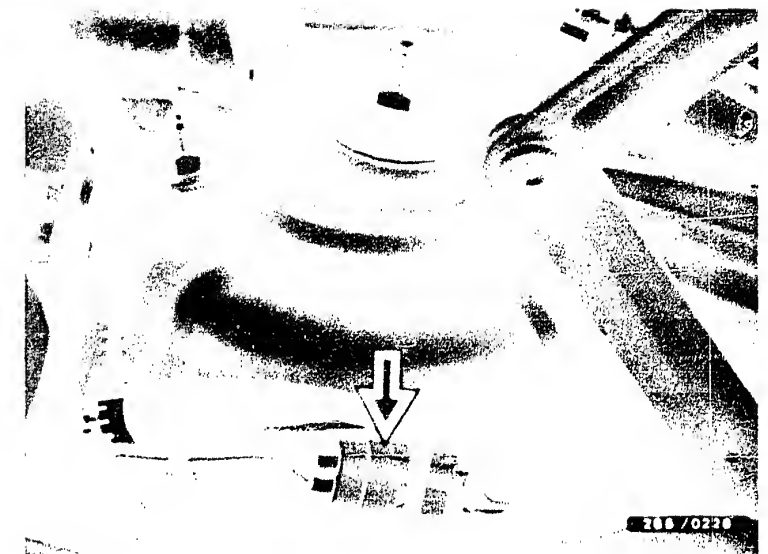
- Plug connectors are in engine compartment on right/left on spring-strut crowns.
- Take apart plug connector.
- Loosen fastening screw for wheel-speed sensor and carefully remove wheel-speed sensor.
Do not use force.
- Loosen mountings of wheel-speed sensor cable and pull cable through rubber grommet in wheel house.

Install wheel-speed sensor on front axle.

- Check O-ring for cracks and replace if necessary.
- Only take new wheel-speed sensor out of protective sleeve when ready for mounting.
- Grease wheel-speed sensor housing lightly with Molykote Longterm 2.
- Make sure that no metallic foreign bodies are on the permanently magnetic edge.
- Carefully press wheel-speed sensor into mounting hole as far as it will go. Do not knock.
- Use new micro-encapsulated fastening screws.
Tighten fastening screws to 6...8 Nm.
- Pull lead into engine compartment and re-fasten at the points provided.

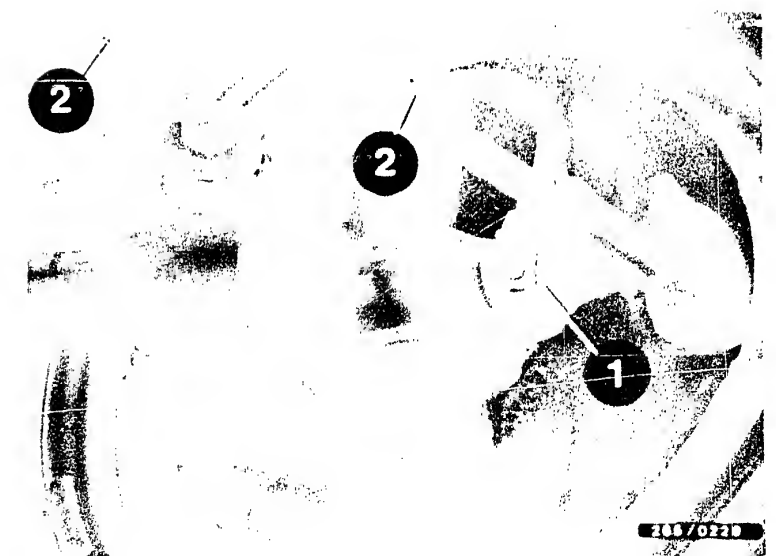
Note: The fastening points of the wheel-speed sensors are provided with color markings.

- Connect wheel-speed sensor to ABS wiring harness and fasten plug connector.
- After repairing, perform test with ABS tester.



Arrow = Wheel-speed sensor
plug connector

1 = Wheel-speed sensor
2 = Fastening points



TEST STEP 31

Operation:

Program-selector switch position

20

Additional operations:

- Let the engine run.
- Select test step 20 and select wheel FL with key FL
- Switch on left-hand brake roller.
- Press brake pedal until the braking force reading on the dynamic brake analyzer is 2000 N (200 kgf).
- Press illuminated key.
- There must be a pressure reduction on the corresponding wheel (front left).
- Release the brake pedal and illuminated key (keep to the sequence of operations so that vehicle does not jump out of the rollers).

Reading:

Instruments on dynamic brake analyzer:

Left-hand reading drops to a value

below 1000 N (100 kgf)

yes
Continue testing with next test step.

no

Trouble-shooting:

- Lamp 2 (red) must not light up.
- Repeat test (possibly with engine stopped and without operation of brake booster)
- Brake lines on hydraulic modulator mixed up? Note markings.
- Check assignment of brake roller to key FL once again.

Testing:

Component:

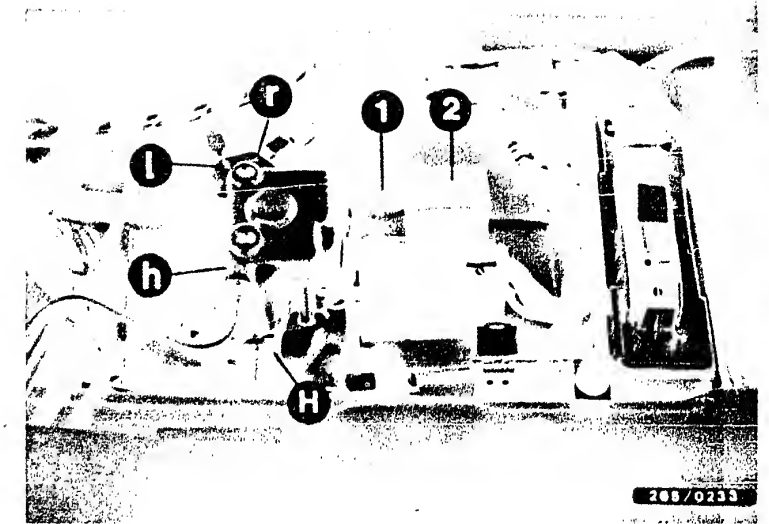
Hydraulic modulator, front axle

Operation:

Mixing up of brake lines

Malfunction:

Reading does not drop.



- 1 = Valve relay
- 2 = Return-pump relay
- l = Connection for brake line front left (wheel-brake cyl.)
- r = Connection for brake line front right (wheel-brake cyl.)
- h = Connection for brake line rear axle (wheel-brake cyl.)
- V = Brake line to brake master cylinder (brake circuit for front axle)
- H = Brake line to brake master cylinder (brake circuit for rear axle)

Caution:

Under no circumstances may the hexagon-socket-head cap screws or Torx screws be loosened. After loosening, the brake circuits can no longer be got free of leaks or can no longer be bled.

Danger!

G14

Test with ABS tester
Volvo 740/760

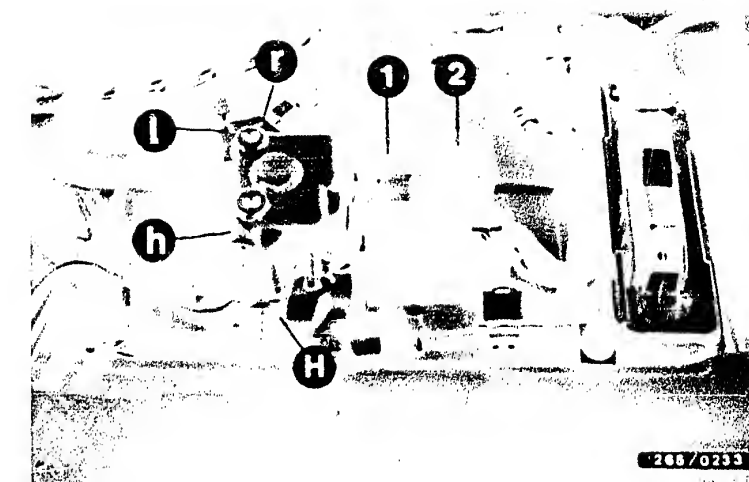


G15

Test with ABS tester
Volvo 740/760



TEST STEP 32		Reading:	Testing:
Operation:			
Program-selector switch position	20	Instruments on dynamic brake analyzer:	Component:
<u>Additional operations:</u> <ul style="list-style-type: none"> Let the engine run. Switch off <u>left-hand</u> brake roller. Switch on <u>right-hand</u> brake roller. Select <u>wheel FR</u> with <u>key FR</u>. Using <u>brake pedal</u>, produce braking force of <u>2000 N</u> (200 kgf). Press illuminated key. There must be a pressure reduction on the corresponding wheel (front right). Release brake pedal and illuminated key. (Follow the sequence of operations so that the vehicle does not jump out of the rollers). 		Right-hand reading drops to a value below 1000 N (100 kgf)	Hydraulic modulator, front axle
		<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> yes Continue test- ing with <u>next</u> test step. </div> <div style="text-align: center;"> no ↓ </div> </div>	Operation:
			Mixing up of brake lines
			Malfunction:
			Reading does not drop.
		<u>Trouble-shooting:</u> <ul style="list-style-type: none"> Lamp 2 (red) must not light up. Repeat test (possibly with engine stopped and without operation of brake booster) Brake lines on hydraulic modulator mixed up? Note markings. Check assignment of brake roller to key FR once again. 	



- 1 = Valve relay
- 2 = Return-pump relay
- l = Connection for brake line front left (wheel-brake cyl.)
- r = Connection for brake line front right (wheel-brake cyl.)
- h = Connection for brake line rear axle (wheel-brake cyl.)
- V = Brake line to brake master cylinder (brake circuit for front axle)
- H = Brake line to brake master cylinder (brake circuit for rear axle)

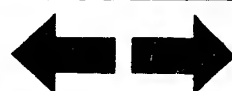
Caution:

Under no circumstances may the hexagon-socket-head cap screws or Torx screws be loosened. After loosening, the brake circuits can no longer be got free of leaks or can no longer be bled.

Danger!

G16

Test with ABS tester
Volvo 740/760



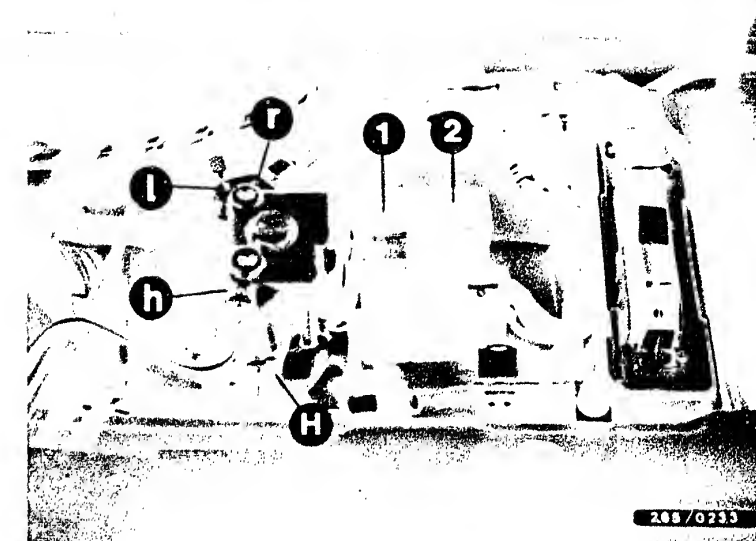
G17

Test with ABS tester
Volvo 740/760



TEST STEP 33		Reading:	Testing:
Operation:			
Program-selector switch position	20	Instruments on dynamic brake analyzer: Left-hand reading drops to a value of 400...1000 N (40...100 kp)	Component: Hydraulic modulator
Additional operations: <ul style="list-style-type: none"> Let the engine run. Switch on <u>left-hand</u> and <u>right-hand</u> brake rollers. Select wheel FL with key FL. Depress brake pedal until instrument on dynamic brake analyzer indicates 2000 N (200 kgf) for the <u>left-hand</u> side. Brake pedal force must not be changed throughout the entire testing procedure. <ul style="list-style-type: none"> Right-hand reading may differ by no more than 500 N (50 kgf) from the left-hand reading. Press illuminated key until test is completed (approx. 10 seconds). Read off <u>left-hand</u> reading. Release brake pedal and illuminated key (follow the sequence of operations so that the vehicle does not jump out of the rollers). 			Operation: Pressure reduction in brake lines <u>front left</u> .
		yes Continue test- ing with next test step.	Malfunction: Braking-force reading less than 400 N or greater than 1000 N.
		Trouble-shooting <ul style="list-style-type: none"> Lamp 2 (red) must not light up. Repeat the test twice and make sure that the braking force is not changed during the testing procedure. Repeat test possibly with engine stopped and without operation of brake booster.	

Continued on G 20



- 1 = Valve relay
- 2 = Return-pump relay
- l = Connection for brake line front left (wheel-brake cyl.)
- r = Connection for brake line front right (wheel-brake cyl.)
- h = Connection for brake line rear axle (wheel-brake cyl.)
- V = Brake line to brake master cylinder (brake circuit for front axle)
- H = Brake line to brake master cylinder (brake circuit for rear axle)

Caution

Under no circumstances may the hexagon-socket-head cap screws or Torx screws be loosened. After loosening, the brake circuits can no longer be got free of leaks or can no longer be bled.

Danger!

G18

Test with ABS tester
Volvo 740/760



G19

Test with ABS tester
Volvo 740/760



TEST STEP 33

Trouble-shooting (continued)

- Rest of the brake system OK? Properly bled?
Brake-line connections not leaking? Brake pads OK?
Brake pads must not be "glazed". Brake discs OK?
Brake must "grip" well.
Brake master cylinder and wheel-brake cylinder OK?
Wheel-brake cylinder and brake pads must move freely.
Clean if necessary.
- Check ground terminals on pump motor and vehicle body.
- Check positive terminal on pump motor.
- Replace hydraulic modulator.



TEST STEP 34

Operation:

Program-selector switch position

20

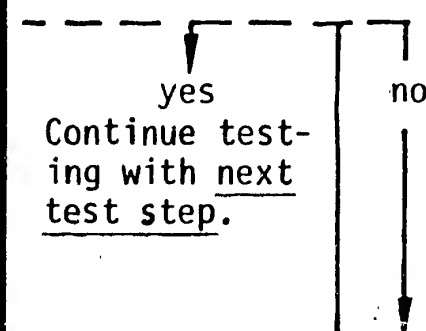
Additional operations:

- Let the engine run.
- Select wheel FR with key FR.
- Press brake pedal until instrument on dynamic brake analyzer indicates 2000 N (200 kgf) for the right-hand side.
- Brake pedal force must not be changed throughout the entire testing procedure.
- Left-hand reading may differ by no more than 500 N (50 kgf) from the right-hand reading.
- Press illuminated key until test is completed (approx. 10 seconds).
- Read off right-hand reading.
- Release brake pedal and illuminated key (follow the sequence of operations so that the vehicle does not jump out of the rollers).

Reading:

Instruments on dynamic brake analyzer:

Right-hand reading drops to a value of 400...1000 N (40...100 kp).



Trouble-shooting

- Lamp 2 (red) must not light up.
 - Repeat the test twice and make sure that the braking force is not changed during the testing procedure.
- Repeat test possibly with engine stopped and without operation of brake booster.

Continued on G 23

Testing:

Component:

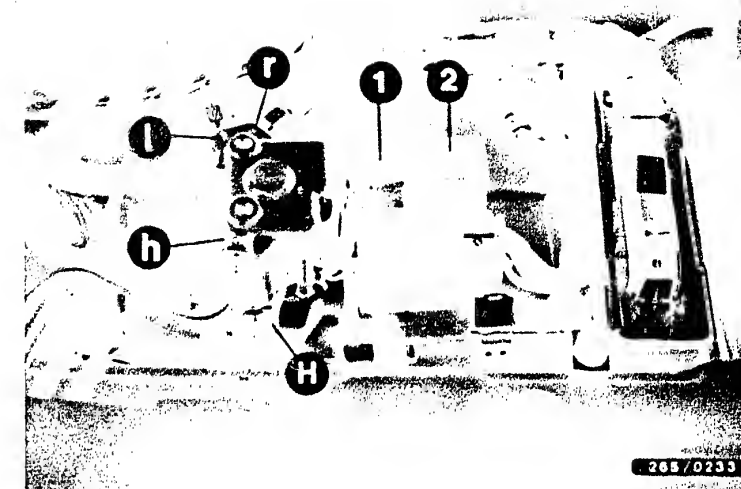
Hydraulic modulator

Operation:

Pressure reduction in brake lines front right

Malfunction:

Braking-force reading less than 400 N or greater than 1000 N



- 1 = Valve relay
- 2 = Return-pump relay
- l = Connection for brake line front left (wheel-brake cyl.)
- r = Connection for brake line front right (wheel-brake cyl.)
- h = Connection for brake line rear axle (wheel-brake cyl.)
- V = Brake line to brake master cylinder (brake circuit for front axle)
- H = Brake line to brake master cylinder (brake circuit for rear axle)

Caution

Under no circumstances may the hexagon-socket-head cap screws or Torx screws be loosened. After loosening, the brake circuits can no longer be got free of leaks or can no longer be bled.

Danger!

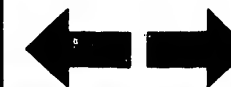
G21

Test with ABS tester
Volvo 740/760



G22

Test with ABS tester
Volvo 740/760



TEST STEP 34

Trouble-shooting (continued)

- Rest of the brake system OK? Properly bled?
Brake-line connections not leaking? Brake pads OK?
Brake pads must not be "glazed". Brake discs OK?
Brake must "grip" well.
Brake master cylinder and wheel-brake cylinder OK?
Wheel-brake cylinder and brake pads must move freely.
Clean if necessary.
- Check ground terminals on pump motor and vehicle body.
- Check positive terminal on pump motor.
- Replace hydraulic modulator.

G23

Test with ABS tester

Volvo 740/760



TEST STEP 35

Operation:

Program-selector switch position

21

Additional operations:

- Let the engine run.
- Switch on both brake rollers.
- Select wheel FL with key FL.
- Press brake pedal until instrument on dynamic brake analyzer indicates 2000 N (200 kgf) for the left-hand side.
- Brake pedal force must not be changed throughout the entire testing procedure.
- Press illuminated key continuously until test is completed (approx. 10 seconds).
- Read off left-hand reading.
- Release brake pedal and illuminated key (follow the sequence of operations so that the vehicle does not jump out of the rollers).

Reading:

Instruments on dynamic brake analyzer:

Left-hand reading drops to an intermediate value and then rises to

1300 ... 1900 N
(130 ... 190 kgf).

yes

Continue test-
ing with next
test step.

no

Testing:

Component:

Hydraulic modulator

Operation:

Pressure buildup in brake lines
front left

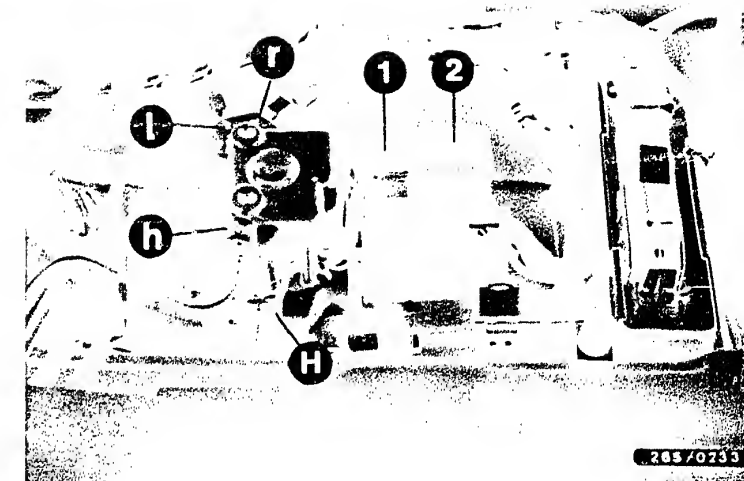
Malfunction:

Braking force reading less than
1300 N or greater than 1900 N.

Trouble-shooting

- Repeat the test twice and make sure that the braking force is not changed during the testing procedure.
Repeat test possibly with engine stopped and without operation of brake booster.

Continued on H 3



- 1 = Valve relay
- 2 = Return-pump relay
- 1 = Connection for brake line front left (wheel-brake cyl.)
- r = Connection for brake line front right (wheel-brake cyl.)
- h = Connection for brake line rear axle (wheel-brake cyl.)
- V = Brake line to brake master cylinder (brake circuit for front axle)
- H = Brake line to brake master cylinder (brake circuit for rear axle)

Caution

Under no circumstances may the hexagon-socket-head cap screws or Torx screws be loosened. After loosening, the brake circuits can no longer be got free of leaks or can no longer be bled.

Danger!

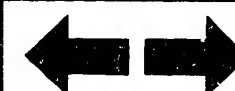
H1

Test with ABS tester
Volvo 740/760



H2

Test with ABS tester
Volvo 740/760



TEST STEP 35

Trouble-shooting (continued)

- Rest of the brake system OK? Properly bled?
Brake-line connections not leaking? Brake pads OK?
Brake pads must not be "glazed". Brake discs OK?
Brake must "grip" well.
Brake master cylinder and wheel-brake cylinder OK?
Wheel-brake cylinder and brake pads must move freely.
Clean if necessary.
- Check ground terminals on pump motor and vehicle body.
- Check positive terminal on pump motor.
- Replace hydraulic modulator.

H3

Test with ABS tester

Volvo 740/760



TEST STEP 36

Operation:

Program-selector switch position

21

Additional operations:

- Let the engine run.
- Select wheel FR with key FR.
- Press brake pedal until instrument on dynamic brake analyzer indicates 2000 N (200 kgf) for the right-hand side.
- Brake pedal force must not be changed throughout the entire testing procedure.
- Press illuminated key continuously until test is completed (approx.10 seconds).
- Read off right-hand reading.
- Release brake pedal and illuminated key (follow the sequence of operations so that the vehicle does not jump out of the rollers).

Reading:

Instruments on dynamic brake analyzer:

Right-hand reading drops to an intermediate value and then rises to

1300 ... 1900 N
(130 ... 190 kgf).

yes
Continue test-
ing with next
test step.

no

Testing:

Component:

Hydraulic modulator

Operation:

Pressure buildup in brake lines
front right

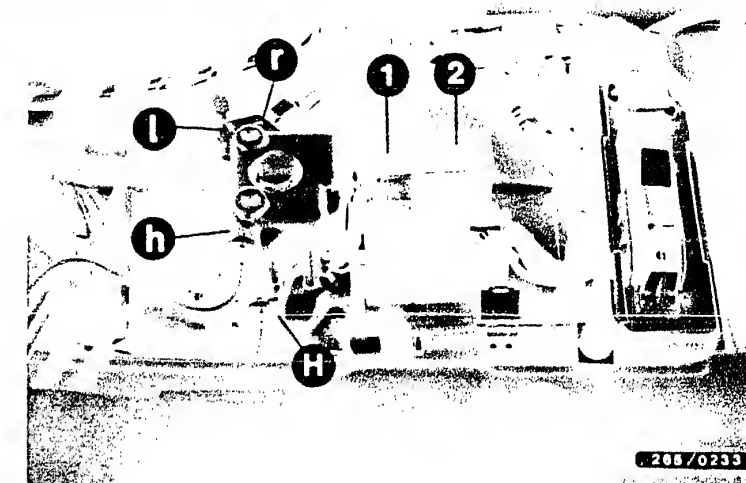
Malfunction:

Braking force reading less than 1300 N or greater than 1900 N.

Trouble-shooting

- Repeat the test twice and make sure that the braking force is not changed during the testing procedure.
Repeat test possibly with engine stopped and without operation of brake booster.

Continued on H 6



- 1 = Valve relay
- 2 = Return-pump relay
- l = Connection for brake line front left (wheel-brake cyl.)
- r = Connection for brake line front right (wheel-brake cyl.)
- h = Connection for brake line rear axle (wheel-brake cyl.)
- V = Brake line to brake master cylinder (brake circuit for front axle)
- H = Brake line to brake master cylinder (brake circuit for rear axle)

Caution

Under no circumstances may the hexagon-socket-head cap screws or Torx screws be loosened. After loosening, the brake circuits can no longer be got free of leaks or can no longer be bled.

Danger!

H4

Test with ABS tester
Volvo 740/760



H5

Test with ABS tester
Volvo 740/760



TEST STEP 36

Trouble-shooting (continued)

- Rest of the brake system OK? Properly bled?
Brake-line connections not leaking? Brake pads OK?
Brake pads must not be "glazed". Brake discs OK?
Brake must "grip" well.
Brake master cylinder and wheel-brake cylinder OK?
Wheel-brake cylinder and brake pads must move freely.
Clean if necessary.
- Check ground terminals on pump motor and vehicle body.
- Check positive terminal on pump motor.
- Replace hydraulic modulator.

H6

Test with ABS tester

Volvo 740/760

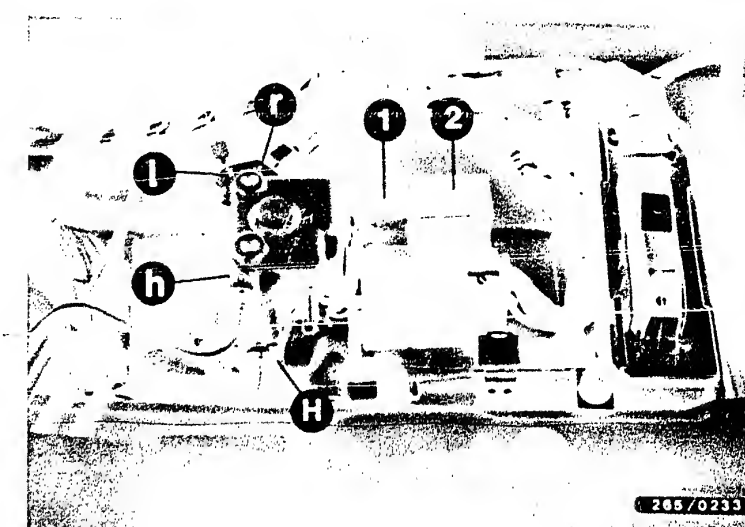


TEST STEP 37		Reading:	Testing:
Operation:			
Program-selector switch position	22	Instruments on dynamic brake analyzer:	Component: Hydraulic modulator
Additional operation: <ul style="list-style-type: none"> Let engine run. Switch on both brake rollers Select key FA. Press brake pedal until instruments of brake analyzer show 2000 N (200 kp). Pedal braking force must not change throughout entire test procedure. Press illuminated key until braking force rises again (after approx. 10 seconds). Read off left-hand reading. Release brake pedal and illuminated key (keep to sequence of operations so that vehicle does not jump out of rollers). 		After twice pressure reduction without return pump the pump is switched on briefly. Brake pedal comes back slightly when pump switches on. <u>drop below inherent friction plus 200 N (20 kgf).</u> The test specification is indicated only for approx. 2.5 seconds and then rises again to the full braking force.	Operation: Pump delivery Front axle brake circuit
		<div> <div>yes</div> <div>Continue testing with next test step.</div> </div> <div>no</div>	Malfunction: Braking-force reading greater than inherent friction plus 200 N

Trouble-shooting:

- Repeat test twice and make sure that brake circuit is not changed during testing. Possibly repeat test with engine stopped and without operation of brake booster.

Continued on H 9



- 1 = Valve relay
- 2 = Return-pump relay
- l = Connection for brake line front left (wheel-brake cyl.)
- r = Connection for brake line front right (wheel-brake cyl.)
- h = Connection for brake line rear axle (wheel-brake cyl.)
- V = Brake line to brake master cylinder (brake circuit for front axle)
- H = Brake line to brake master cylinder (brake circuit for rear axle)

Caution

Under no circumstances may the hexagon-socket-head cap screws or Torx screws be loosened. After loosening, the brake circuits can no longer be got free of leaks or can no longer be bled.

Danger!

H7

Test with ABS tester

Volvo 740/760



H8

Test with ABS tester

Volvo 740/760



TEST STEP 37

Trouble-shooting (continued)

- Rest of the brake system OK? Properly bled?
Brake-line connections not leaking? Brake pads OK?
Brake pads must not be "glazed". Brake discs OK?
Brake must "grip" well.
Brake master cylinder and wheel-brake cylinder OK?
Wheel-brake cylinder and brake pads must move freely.
Clean if necessary.
- Check ground terminals on pump motor and vehicle body.
- Check positive terminal on pump motor.
- Replace hydraulic modulator.

H9

Test with ABS tester

Volvo 740/760



Rear axle - Carry out program-selector switch position 23 first since it is assumed for the following test steps that the wheel-speed sensors are in proper working order.

TEST STEP 38

<u>Operation:</u>		<u>Reading:</u>	<u>Testing:</u>
Program-selector switch position	23	Digital display unit 1,8 ... 19	<u>Component:</u> Wheel-speed sensor for rear axle
<u>Additional operations:</u> <ul style="list-style-type: none"> • Drive front wheels of vehicle onto dynamic brake analyzer. • Switch on the ignition. • Selct wheel RA with key RA. • Switch on left-hand brake roller. • Make reading. 		In case of fluctuating readings, the lowest reading is valid. <u>Note:</u> If reading is 1,8, check air gap.	
		yes Continue testing with next test step.	<u>Operation:</u> Wheel-speed sensor signal
		no	<u>Malfunction:</u> Reading less than 1,8 or greater than 19



1=Wheel-speed sensor plug connector
2=Tank filler neck

1=Wheel-speed sensor in rear-axle housing
2=Shim
3=Oil-drain plug

Trouble-shooting (switch off ignition)

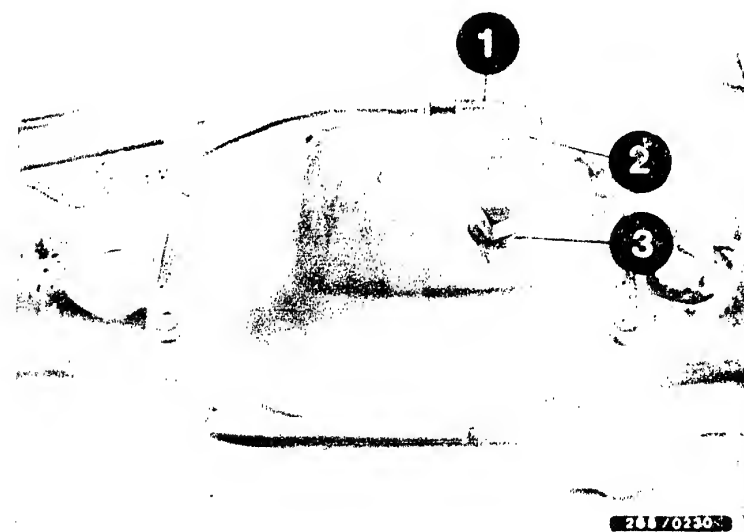
A reading of 999 signifies:

- Speed of dynamic brake analyzer too great (above approx. 13 km/h).

Reading 0 or less than 1,8:

- Wheel-speed sensors mixed up? Check assignment: Wheel-speed sensors must be connected to the specified wheel and controller input (see circuit diagram).
- Air gap between wheel-speed sensor and ring gear too great. Check installation.
- Replace wheel-speed sensor.

Continued on H 12/H 13



H10

Test with ABS tester
Volvo 740/760



H11

Test with ABS tester
Volvo 740/760



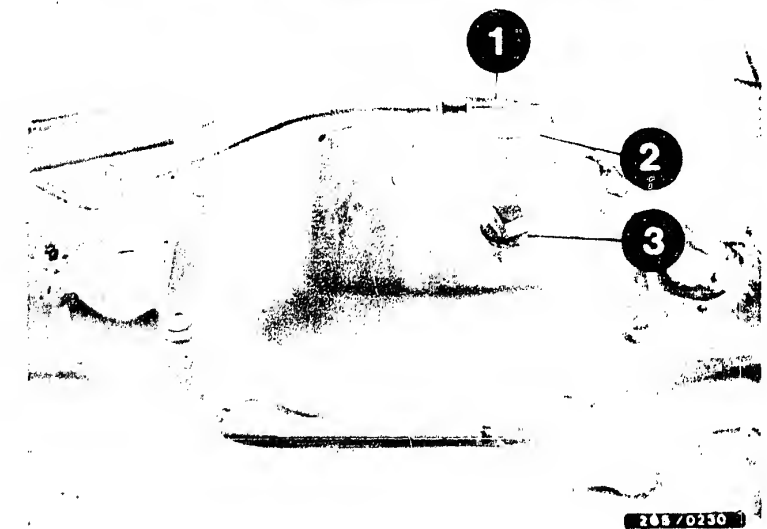
Trouble-shooting - TEST STEP 38 (continued)

Remove wheel-speed sensor on rear axle

- Take apart plug connector in luggage compartment:
- Loosen fastenings of lead and pull wheel-speed sensor lead downward through bottom of luggage compartment.
- Loosen fastening screw and pull out wheel-speed sensor.
Do not use force. Do not lose shim, use for re-installation.

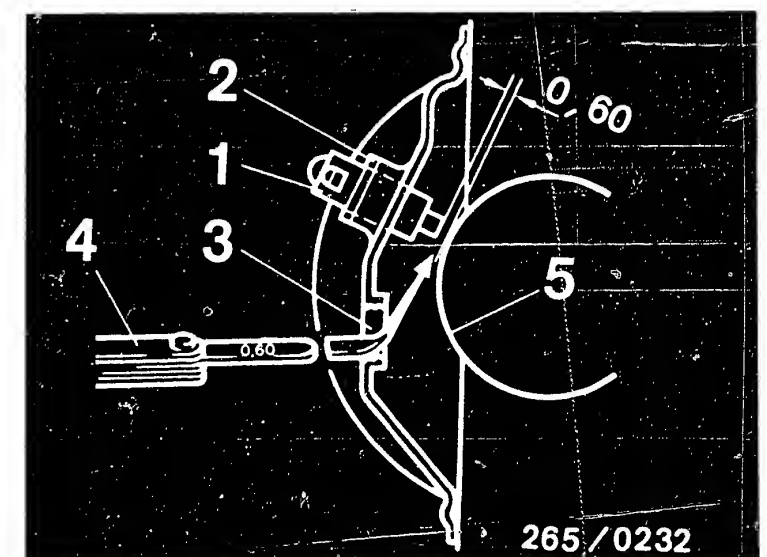
Install wheel-speed sensor on rear axle

- Check O-ring for cracks and replace if necessary.
- Only take new wheel-speed sensor out of protective sleeve when ready for mounting.
- Grease wheel-speed sensor housing lightly with Molykote Longterm 2. Mount shim(s).
- Make sure that no metallic foreign bodies are on the permanently magnetic edge.
- Carefully press wheel-speed sensor into mounting hole as far as it will go. Do not knock.
- Measure air gap between wheel-speed sensor edge and ring gear with feeler gauge. Should be: 0.35 ... 0.75 mm. If necessary, adjust air gap to nominal dimension 0.6 mm with shim. To measure the air gap, remove the oil-drain plug and introduce feeler gauge as shown. Turn drive bevel gear slightly. Shims are obtainable from Volvo agents in thicknesses between 1.0 and 1.8 mm in stages of 0.2 mm.
- Use new micro-encapsulated fastening screw.
Tighten fastening screws to 6 ... 8 Nm.
- Re-fasten lead at points provided.
- Connect wheel-speed sensor to ABS wiring harness.
- After repairing, perform test with ABS tester.



1=Wheel-speed sensor in rear-axle housing
2=Shim
3=Oil-drain plug

1=Wheel-speed sensor
2=Shim
3=Oil-drain plug
4=Feeler gauge
5=Drive bevel gear



H12

Test with ABS tester
Volvo 740/760

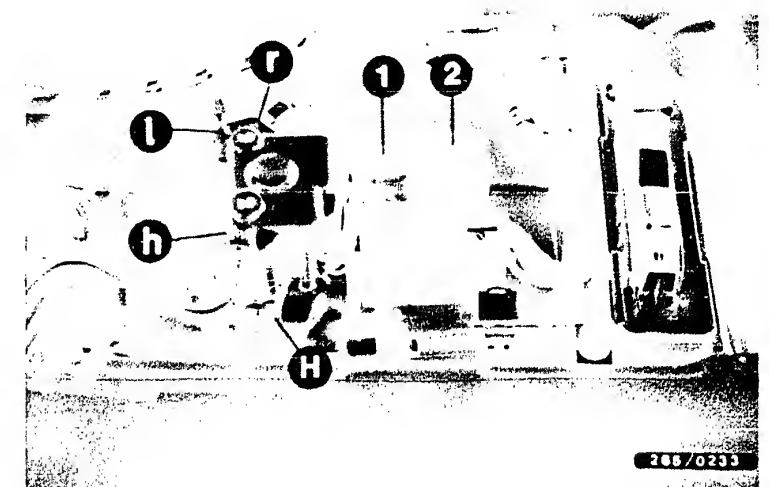


H13

Test with ABS tester
Volvo 740/760



TEST STEP 39			
Operation:		Reading:	Testing:
Program-selector switch position	20	Instruments on dynamic brake analyzer:	Component:
<u>Additional operation:</u> <ul style="list-style-type: none"> Let engine run. Select program switch position 20. Select rear axle with key RA. Switch on brake roller. Produce 2000 N (200 kgf) braking force with brake pedal. Press illuminated key. There must be pressure reduction on both wheels. Release brake pedal and illuminated key. (Follow sequence of operations so that vehicle does not jump out of rollers).		Left-hand reading moves to a value	Hydraulic modulator, rear axle
		below 1000 N (100 kgf).	Operation:
		<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> yes Continue testing with next test step. </div> <div style="text-align: center;"> no ↓ </div> </div>	Mixing up of brake lines
		Trouble-shooting:	Malfuntion:
		<ul style="list-style-type: none"> Lamp 2 (red) must not light up. Repeat test. Brake lines mixed up on hydraulic modulator? Follow markings. Correct key (RA) pressed? Replace hydraulic modulator. 	Reading does not drop



- 1 = Valve relay
- 2 = Return-pump relay
- l = Connection for brake line front left (wheel-brake cyl.)
- r = Connection for brake line front right (wheel-brake cyl.)
- h = Connection for brake line rear axle (wheel-brake cyl.)
- V = Brake line to brake master cylinder (brake circuit for front axle)
- H = Brake line to brake master cylinder (brake circuit for rear axle)

Caution

Under no circumstances may the hexagon-socket-head cap screws or Torx screws be loosened. After loosening, the brake circuits can no longer be got free of leaks or can no longer be bled.

Danger!

H14

Test with ABS tester
Volvo 740/760

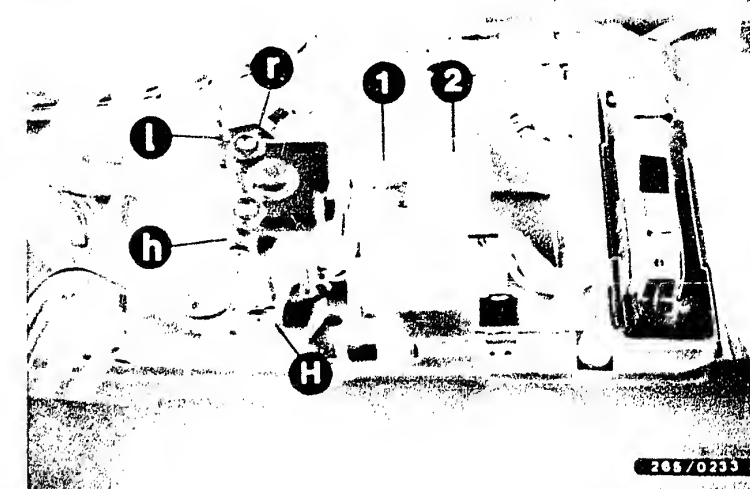


H15

Test with ABS tester
Volvo 740/760



TEST STEP 40		Reading:	Testing:
Operation:			
Program-selector switch position	20	Instruments on dynamic brake analyzer: Reading drops to a value of 300 ... 1000 N (30 ... 100 kgf).	Component: Hydraulic modulator
Additional operations: <ul style="list-style-type: none"> Let the engine run. Switch on left-hand and right-hand brake rollers. Select rear axle with key RA. Press the brake pedal until the instrument on the dynamic brake analyzer indicates 2000 N (200 kgf) for the left-hand side. Brake pedal force must not be changed throughout the entire measuring procedure. <ul style="list-style-type: none"> Right-hand reading may differ by no more than 500 N (50 kgf) from the left-hand reading. Press illuminated key until test is completed (approx. 10 seconds). Read off reading. Release brake pedal and illuminated key (follow the sequence of operations so that the vehicle does not jump out of the rollers). 		Operation: Pressure reduction in rear axle brake lines	Malfunction: Braking-force reading less than 300 N or greater than 1000 N
		<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> yes Continue testing with next test step. </div> <div style="text-align: center;"> no ↓ </div> </div>	
		Trouble-shooting: <ul style="list-style-type: none"> Lamp 2 (red) must not light up. Repeat the test twice and make sure that the braking force is not changed during the testing procedure. Continued on H 18	



- 1 = Valve relay
- 2 = Return-pump relay
- l = Connection for brake line front left (wheel-brake cyl.)
- r = Connection for brake line front right (wheel-brake cyl.)
- h = Connection for brake line rear axle (wheel-brake cyl.)
- V = Brake line to brake master cylinder (brake circuit for front axle)
- H = Brake line to brake master cylinder (brake circuit for rear axle)

Caution:

Under no circumstances may the hexagon-socket-head cap screws or Torx screws be loosened. After loosening, the brake circuits can no longer be got free of leaks or can no longer be bled.

Danger!



TEST STEP 40

Trouble-shooting (continued)

- Rest of the brake system OK? Properly bled?
Brake-line connections not leaking? Brake pads OK?
Brake pads must not be "glazed". Brake discs OK?
Brake must "grip" well.
Brake master cylinder and wheel-brake cylinder OK?
Wheel-brake cylinder and brake pads must move freely.
Clean if necessary.
- Check ground terminals on pump motor and vehicle body.
- Check positive terminal on pump motor.
- Replace hydraulic modulator.

H18

Test with ABS tester

Volvo 740/760



TEST STEP 41

Operation:

Program-selector switch position

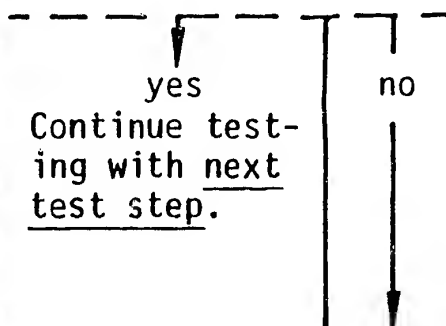
21

Additional operations:

- Let engine run.
- Switch on both brake rollers.
- Select rear axle with key RA.
- Press brake pedal until instrument on dynamic brake analyzer indicates 2000 N (200 kgf) for left-hand side.
- Brake pedal force must not be changed throughout the entire test procedure.
- Press illuminated key until test is completed (approx. 10 seconds).
- Read off left-hand reading.
- Release brake pedal and illuminated key (follow sequence of operations so that vehicle does not jump out of rollers).

Reading:

Instruments on dynamic brake analyzer:
Left-hand reading drops to an intermediate value and then rises to
1000 ... 1800 N
(100 ... 180 kgf).



Trouble-shooting:

- Repeat the test twice and make sure that the braking force is not changed during the testing procedure (let the engine run).

Continued on H 21

Testing:

Component:

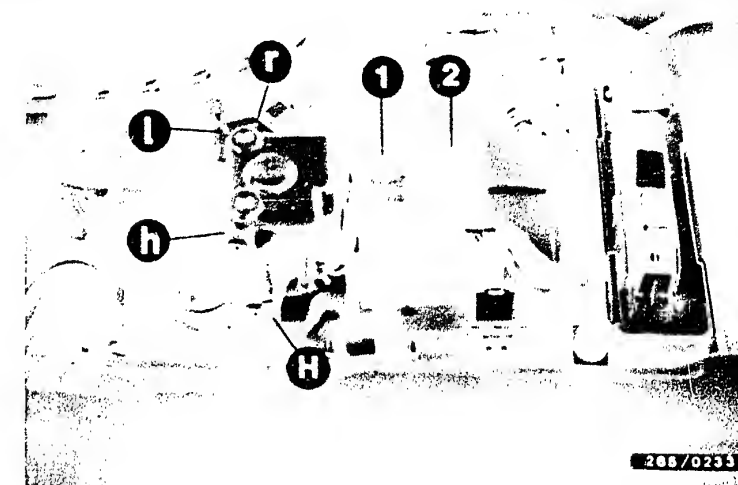
Hydraulic modulator

Operation:

Pressure buildup in rear-axle brake lines

Malfunction:

Braking force reading less than 1000 N or greater than 1800 N.



- 1 = Valve relay
- 2 = Return-pump relay
- l = Connection for brake line front left (wheel-brake cyl.)
- r = Connection for brake line front right (wheel-brake cyl.)
- h = Connection for brake line rear axle (wheel-brake cyl.)
- V = Brake line to brake master cylinder (brake circuit for front axle)
- H = Brake line to brake master cylinder (brake circuit for rear axle)

Caution

Under no circumstances may the hexagon-socket-head cap screws or Torx screws be loosened. After loosening, the brake circuits can no longer be got free of leaks or can no longer be bled.

Danger!

H19

Test with ABS tester

Volvo 740/760



H20

Test with ABS tester

Volvo 740/760



TEST STEP 41

Trouble-shooting (continued)

- Rest of the brake system OK? Properly bled?
Brake-line connections not leaking? Brake pads OK?
Brake pads must not be "glazed". Brake discs OK?
Brake must "grip" well.
Brake master cylinder and wheel-brake cylinder OK?
Wheel-brake cylinder and brake pads must move freely.
Clean if necessary.
- Check ground terminals on pump motor and vehicle body.
- Check positive terminal on pump motor.
- Replace hydraulic modulator.

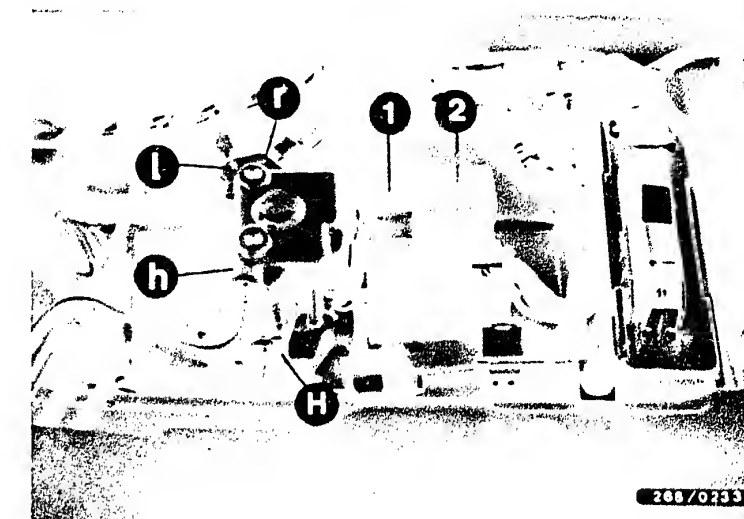
H21

Test with ABS tester

Volvo 740/760



TEST STEP 42			
Operation:		Reading:	Testing:
Program switch position	22	<p>Instruments on dynamic brake analyzer: After twice pressure reduction without return pump the pump is switched on briefly. Brake pedal comes back slightly when pump switches on. Then braking-force reading on both sides must drop below inherent friction plus 200 N (20 kp).</p> <p>The test specification is indicated only for approx. 2.5 seconds and then rises again to the full braking force.</p> <p>If reading O.K., the test with ABS tester is completed. As a final check, perform a road test: With the engine running, the indicator lamp must go out. Drive at least 30 km/h. Indicator lamp must not come on again.</p>	<p>Component: Hydraulic modulator</p>
<p><u>Additional operation:</u></p> <ul style="list-style-type: none"> Let engine run. Select rear wheels with key RA. Switch on both brake rollers. Press brake pedal until instrument on dynamic brake analyzer indicates 2000 N (200 kgf) for <u>right-hand side</u>. Brake pedal force must not be changed throughout the entire test procedure. Press illuminated key until test is completed (approx. 10 seconds). Make reading. Release brake pedal and illuminated key (follow sequence of operations so that vehicle does not jump out of rollers). 		<p><u>Operation:</u></p> <p>Pump delivery Brake circuit for rear axle</p>	
		<p><u>Malfunction:</u></p> <p>Braking-force reading greater than inherent friction plus 200 N</p>	



- 1 = Valve relay
- 2 = Return-pump relay
- l = Connection for brake line front left (wheel-brake cyl.)
- r = Connection for brake line front right (wheel-brake cyl.)
- h = Connection for brake line rear axle (wheel-brake cyl.)
- V = Brake line to brake master cylinder (brake circuit for front axle)
- H = Brake line to brake master cylinder (brake circuit for rear axle)

Caution:

Under no circumstances may the hexagon-socket-head cap screws or Torx screws be loosened. After loosening, the brake circuits can no longer be got free of leaks or can no longer be bled.

Danger!

Trouble-shooting:

- Repeat test twice and make sure that braking force is not changed during testing.

Continued on H 24

H22

Test with ABS tester

Volvo 740/760



H23

Test with ABS tester

Volvo 740/760



TEST STEP 42

Trouble-shooting (continued)

- Rest of the brake system OK? Properly bled?
Brake-line connections not leaking? Brake pads OK?
Brake pads must not be "glazed". Brake discs OK?
Brake must "grip" well.
Brake master cylinder and wheel-brake cylinder OK?
Wheel-brake cylinder and brake pads must move freely.
Clean if necessary.
- Check ground terminals on pump motor and vehicle body.
- Check positive terminal on pump motor.
- Replace hydraulic modulator.

H24

Test with ABS tester

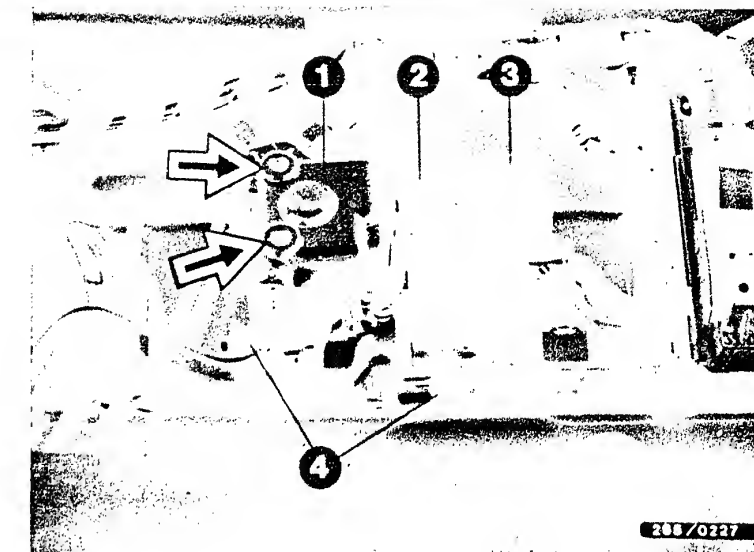
Volvo 740/760



Replacement of hydraulic modulator
(Applies only to test steps 31...37 and 39...42)

Removing the hydraulic modulator

- For safety reasons, the hydraulic modulator must not be repaired, but the complete unit must be replaced. Exceptions to this are the return-pump relay and the valve relay. Both relays may be replaced.
- Apart from the brake-line connections no screws on the hydraulic modulator may be loosened. The hexagon-socket-head cap screws (arrows) may under no circumstances be loosened. After loosening, the brake circuits can no longer be got free of leaks or the brake circuits can no longer be bled.
Danger!
- Check the hydraulic modulator and brake-line connections for leaks by means of a visual examination. If brake fluid is escaping, tighten the brake-line connections (12...16 Nm) or replace, or replace the hydraulic modulator.



- 1 = Hydraulic modulator
- 2 = Valve relay
- 3 = Return-pump relay
- 4 = Fastening

Continued on J 3/J 4

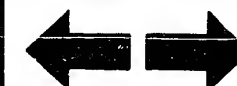
J1

Test with ABS tester
Volvo 740/760



J2

Test with ABS tester
Volvo 740/760



Replacement of hydraulic modulator (continued)

Pay particular attention to the joints identified by arrows. On the base of the hydraulic modulator there is a vent hole to the pump pistons. A slight escape of brake fluid at this point is possible.

A complaint is only justified if, after pressing the brake pedal several times, a pool of brake fluid is formed under the hydraulic modulator.

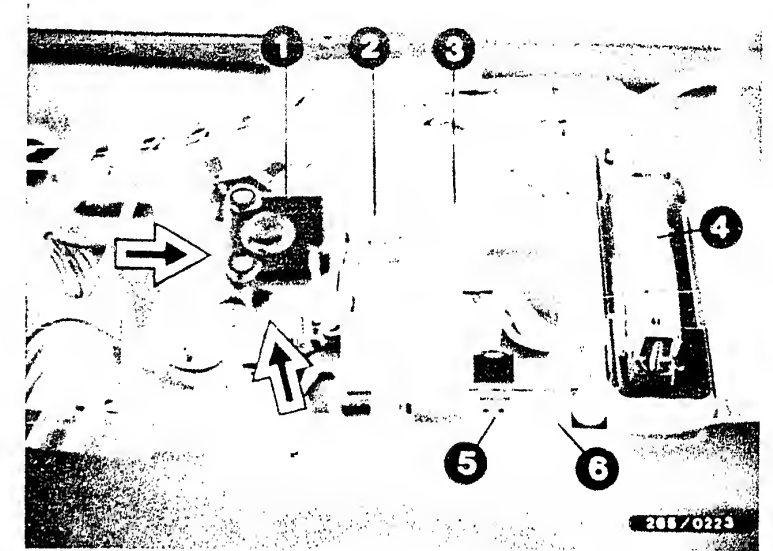
- When removing and installing the brake lines, make sure that the lines are marked in accordance with the markings on the hydraulic modulator and that they are not mixed up when re-connecting (e.g. FL of hydraulic modulator must be connected to the front left wheel brake cylinder).

- Markings on hydraulic modulator:

l = Connection for brake line front left (wheel-brake cylinder)
r = Connection for brake line front right (wheel-brake cylinder)
h = Connection for brake line of rear axle

V = Front axle brake circuit from brake master cylinder
H = Rear axle brake circuit from brake master cylinder

Continued on J 5/J 6



1 = Hydraulic modulator
2 = Valve relay
3 = Motor relay
Arrows = Joints

J3

Test with ABS tester
Volvo 740/760



J4

Test with ABS tester
Volvo 740/760

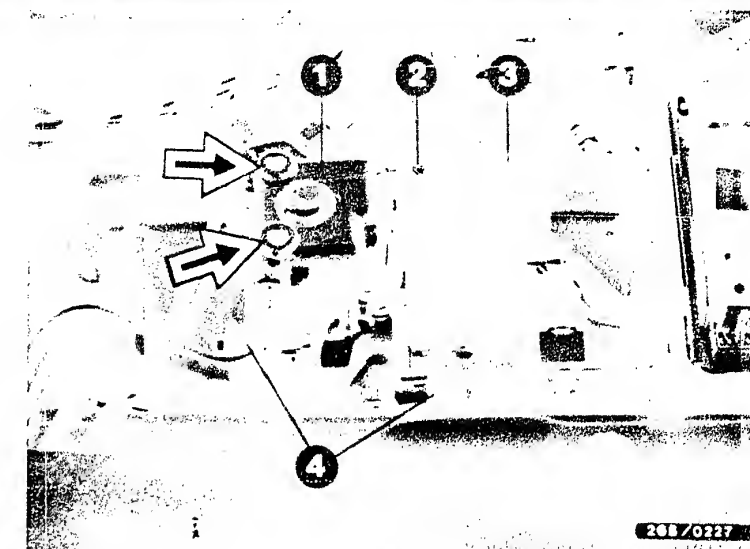


Replacement of hydraulic modulator (continued)

- Use only the specified double-end flare nut wrench 9x11 mm for loosening and tightening the brake lines.
- Mark brake lines and remove from hydraulic modulator.
- Catch the brake fluid and do not bring it into contact with your skin or clothing or with paintwork.
- Immediately seal the brake lines and connections with dummy plugs.
- Disconnect ground cable from pump motor.
- Loosen fastening screw and remove cover.
- Loosen bracket and remove plug.
- Loosen hexagon nuts from holder and remove hydraulic modulator.

Installation

- Mount hydraulic modulator in the holder and fasten with the hexagon nuts.
- Connect ground cable to pump motor. Plug on 12-pin plug and fasten with the bracket.
- Fasten cover on the hydraulic modulator with the screw.
- Connect the brake lines to the hydraulic modulator in accordance with the markings.
- Note tightening torque for brake line connections on hydraulic modulator: 12...16 Nm.
- Bleed the brake system and check for leaks.
- Fully test the ABS with the tester.



- 1 = Hydraulic modulator
- 2 = Valve relay
- 3 = Return-pump relay
- 4 = Fastening

J5

Test with ABS tester
Volvo 740/760



J6

Test with ABS tester
Volvo 740/760



Technical Bulletin

Only for use within the Bosch organization. No to be communicated to any third party.

13...39

NO REPAIRS PERMITTED/
MAXIMUM ALLOWABLE SHELF LIFE
FOR ABS HYDRAULIC MODULATORS

VDT-I 265/102 En

7.1984

supersedes edition 1.1980

1. No repairs permitted

The passenger-car ABS is a piece of safety equipment. As a result of unauthorized interference with the ABS components there is the danger that the efficient operation of the ABS system will be adversely affected.

We would point out, therefore, that the hydraulic modulator must under no circumstances be repaired. For safety reasons it must be exchanged as a complete unit.

It is only permitted to exchange the motor and valve relay. All other screws and plugs must not be loosened.

2. Maximum allowable shelf life

The maximum allowable shelf life for hydraulic modulators is 2 years, reckoned from the production date (FD) given on the product. When the maximum shelf life is reached, the hydraulic modulator must be subjected to a functional check.

This functional check can only be performed in the specialist department of Robert Bosch GmbH. Once checked, the hydraulic modulators are identified with

L and new FD. After a further 2 years, i.e. after a total of 4 years shelf life, it is necessary for all rubber and plastic parts to be exchanged at the factory.

N1

Technical Bulletin

Volvo 740/760



Service workshops outside Germany should send the hydraulic modulators to:

Robert Bosch GmbH
KH/LAV 2 - Auspackraum
z. W. an K1 / VAK 2
Auf der Breit 4

7500 Karlsruhe 41.

The hydraulic modulators should be sent in to us postage-paid. On the enclosed delivery note please quote this Technical Bulletin.

The functional check is performed subject to payment.

Published by:

Robert Bosch GmbH
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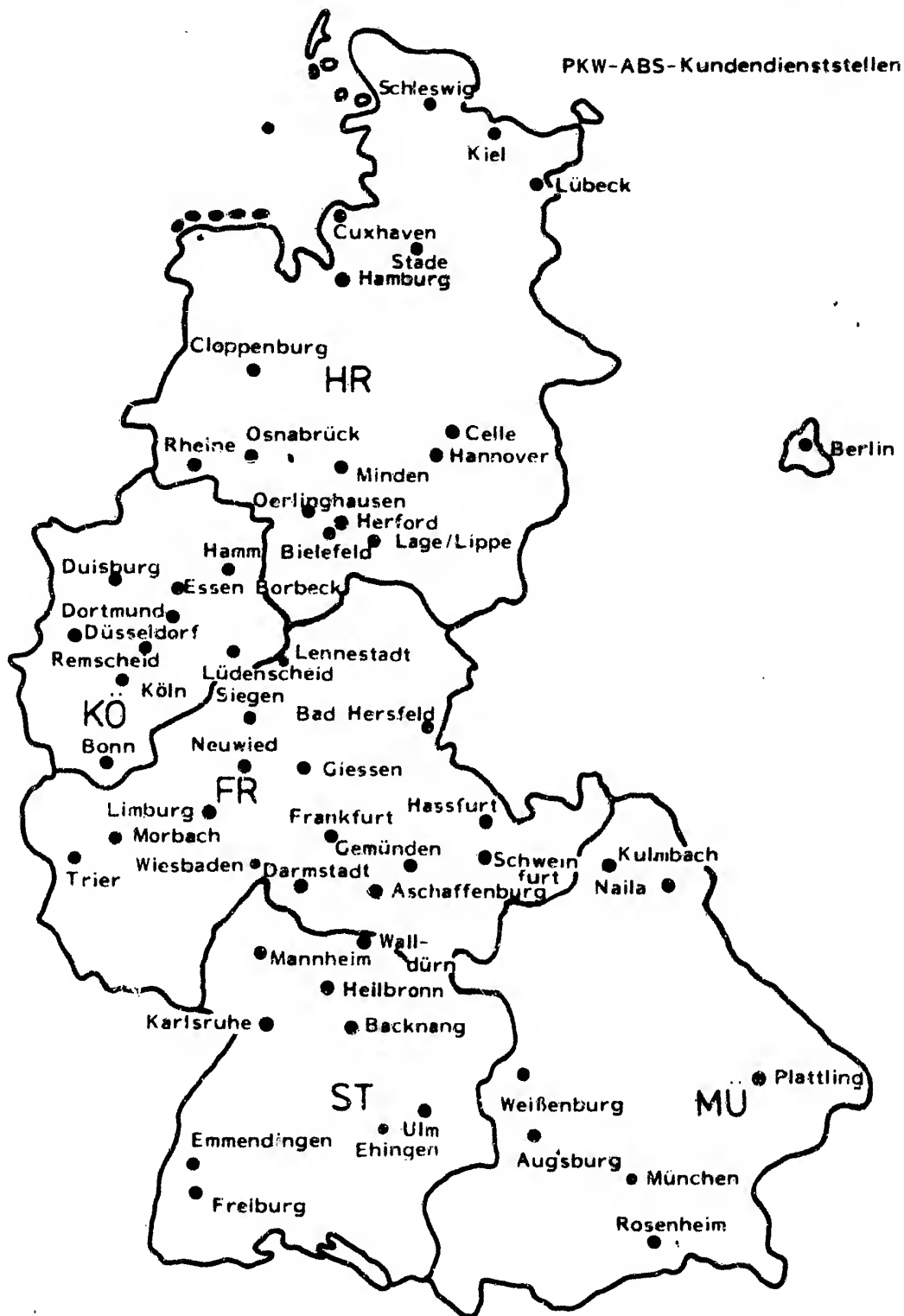
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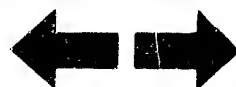
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N9

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N12

Technische Mitteilung

Volvo 740/760



INHALTSVERZEICHNIS

<u>Abschnitt</u>	<u>Koordinaten</u>
Aufbau der Mikorkarte.....	A 1
Besonderheiten.....	A 2
1. Prüfwerte.....	A 3
2. Prüfvoraussetzungen.....	A 3 - A 4
3. Schnellprüfliste.....	A 5 - A 18
4. Elektrischer Anschlußplan.....	A 19 - A 20
5. Einbaulage der Komponenten.....	A 21 - A 23
6. Prüfgeräte und Werkzeuge.....	B 1 - B 2
7. Bremsanlage entlüften.....	B 3 - B 4
8. Dichtheitskontrolle der Bremsanlage....	B 5 - B 6
9. Allgemeine Hinweise.....	B 7 - B 8



Inhaltsverzeichnis (Fortsetzung)

Abschnitt

Koordinaten

Fehlersuche.

10. ABS-Kontrollampe prüfen.....	B 9 - B 11
11. ABS-Prüfgerät.....	B 12 - B 17
12. Prüfvoraussetzungen.....	B 18 - B 22
13. Prüfung mit ABS-Prüfgerät.....	C 1 - J 6
Technische Mitteilungen.....	N 1 - N 12

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